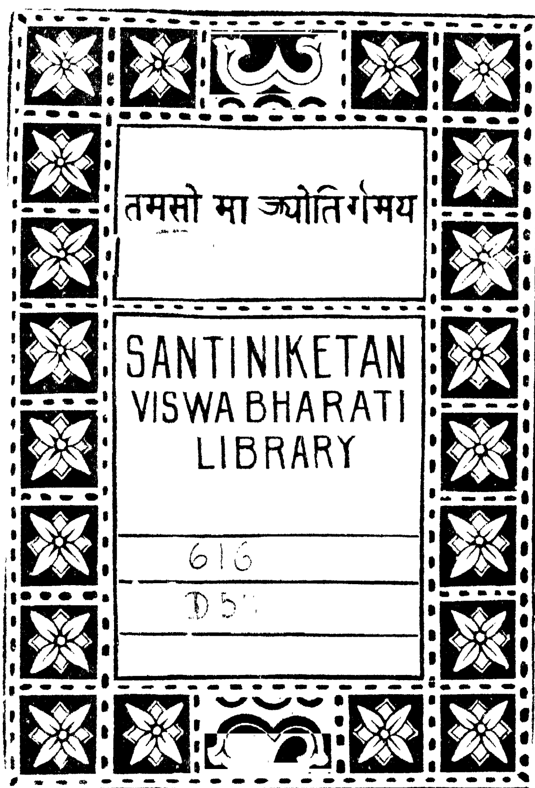


MEDICAL TREATMENT
IN
GENERAL PRACTICE
WITH
RECENT ADVANCES

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BY

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WITH A FOREWORD TO THE FIRST EDITION

BY

Bt. Col. Sir. R. N. CHOPRA, K.T. M.D., SC. D. (CANTAB) ETC.

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MADE IN INDIA

TO

THE REVERED MEMORY

OF

MY PARENTS

FOREWORD TO THE FIRST EDITION

BY

Bt.-Col. R. N. CHOPRA, C.I.E., M.D., SC.D, (*Cantab*), F.R.C.P. (*Lond.*), I.M.S., Honorary Physician to the King, Director, School of Tropical Medicine, and Senior Physician, Carmichael Hospital for Tropical Diseases, Calcutta.

The greater part of the space in books on medicine is generally devoted to the description of the aetiology, diagnosis and symptomatology of a disease and the treatment is only perfunctorily dealt with. A complete modern treatise on treatment, keeping in view the conditions existing in India, is yet to be written. The general practitioner has, therefore, always felt the want of a book dealing adequately with treatment, and this book is intended to supply the want. Dr. Dhar has given a short, summarised, yet adequate and above all an up-to-date account of the treatment of different diseases as met with in India while keeping in mind the conditions under which the medical practitioners have to work. It makes good reading and the references given in foot-notes are a welcome feature as these are likely to stimulate the reader to consult the books and journals referred to. The symptoms and differential diagnosis of various diseases are lightly dealt with and the treatment is discussed in detail under appropriate headings so as to make the facts easily accessible. The recent advances in therapeutics are admirably brought out and a large number of prescriptions have been given which greatly enhance the value of the book. The European and American text-books which are greatly used in this country make no mention of the Indian dietary, and the physician in India is left without any guidance as to the local substitutes. The inclusion of Indian preparations in the description of the diet given

by this author should greatly appeal to medical practitioners, particularly in Bengal. The author does not pretend to lay stress on tropical diseases but the treatment of various maladies so-called tropical has been adequately described.

Such successful results could not have been achieved by compilation alone, for to record so concisely and lucidly the essential facts requires personal knowledge of the various aspects of therapeutics as practised in this country. There is no doubt that the wide personal experience of the author as a practising physician combined with his experience as a teacher, has enabled him to complete his task successfully.

I wish to congratulate Dr. Dhar on his achievement and trust that this volume, in the writing of which he spent many long years, will meet with success it deserves.

School of Tropical Medicine,
Calcutta.
February, 1939.

R. N. CHOPRA.

PREFACE TO THE FIRST EDITION

The present volume is an out-come of the experience in medical teaching for a period of over ten years, which has given me the impression, that it is not always possible to devote, while teaching, such time, care and attention that treätment of diseases demand. Medicine is such a vastly growing subject, that it is not possible for the general practitioner and the senior student to keep pace with its recent advances, so every attempt has been made to incorporate in this book, the recent developments in therapy. As it is not customary to include clinical features in a book on treatment, an insignificant space has been devoted for this purpose, stressing on the clinical aspect, with a view to help the diagnostic task of the practitioners away from the laboratory aids.

This work does not claim for itself to be a complete treatise on treatment, and though primarily intended to meet the difficulties in tropical practice, yet the diseases common in temperate climates, but met-with in tropical general practice, have not been neglected.

The number of drugs used in treatment are daily on the increase, and are growing to a legion, here to choose effective ones is rather difficult. Inorder to guide the young practitioner, adequate number of fitting prescriptions have been included in the text.

Selection of Indian diet is often puzzling to the young doctor, so, as far as possible a complete list of Indian dietary has also been given.

The arrangement of the chapters may not appear well-planned, but the first portion deals with acute infectious processes of most of the systems then follow the commoner diseases system by system.

In getting the book ready I have got help from numerous sources, most of them are gratefully acknowledged at the foot-notes.

I am extremely thankful to Col. R. N. Chopra, for the foreword he has so kindly written to this volume.

Lastly, nothing will be more gratifying to me, than to find the book useful to those for whom it is intended.

Medical College,
Calcutta,
March, 1939.

D. R. DHAR.

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MEDICAL TREATMENT IN GENERAL PRACTICE WITH RECENT ADVANCES.

CHAPTER I.

INTRODUCTION TO TREATMENT

The perfect machine.

The human system, resulting from an evolutionary process of millions of years, is endowed with the most amazing power of adaptability to circumstances, adverse or otherwise. The heart supplies faithfully the optimum quota of blood to the different organs under varying conditions of stress and strain. The kidneys filter with greater accuracy a huge lot of surprisingly complex fluid, during the whole span of life of an individual, than the best filter-bed, ever conceived, is capable of doing. Brain the master-mechanist, the subtle biochemical regulating hormones, the finished defensive juices, the fighting white blood corpuscles, act as everwakeful alert soldiers, all for the upkeep and protection of the system.

Disease results from small burdens, accumulated for some time, acting collectively or in parts.

Such a perfectly organised mechanism to fall victim to diseased processes, should mean much more than we apparently see or can search out. Little burdens, may be in the form of some chronic focal sepsis, defective nutrition, bad air or water supply, unhygienic living, even a psychic trauma, while acting singly might not have probably been sufficient to produce disease, when had their accumulated collective injurious effects, would give rise to some disorder, to be called a disease, when serious.

Little burdens should be unloaded, and the resistance ***built up*** *by all means at our command.*

Hence in our plan of treatment not only these little loads should be unburdened, but also no stone should be left unturned, to raise the threshold of resistance of the patient, through medicines, fresh air and water, light, sun, physical and even psychical measures, and also by a judicious care and regulation of his habits, dietetic regime etc. Because it is the

raised body resistance of the patient, on which, we have to depend ultimately for a cure.

Significance of sub-health.

There are numerous ill-nourished persons in our country whose state of physical inferiority though cannot be labelled as diseased, yet are in such a state of sub-health, that any slight additional burden will push them into the category of the ill, hence also the supreme need of raising the body-resistance of these persons by all means at our command, specially to hasten cure during their illness.

Multiple pathological processes.

In our poor country, a patient seldom seeks medical aid, specially when he has got to pay for it, unless he is more or less disabled, which usually means, multiplicity of patho logical processes, hence the medical man should try his best to find out all the conditions leading to the undermining of the health of that individual and try to remedy them.

A proper diagnosis is indispensable for treatment.

In our system of medical practice, no treatment, not to speak of a cure, is possible without a proper diagnosis. For this purpose, a systematic case taking is invaluable[1]. While taking history, patience, tact, judgement and sympathy from the doctor will elicit all that one may expect. Good bedside manners count in practice too.

Examination should be thorough and include all the systems.

Even in cases where the diagnosis is obvious, a thorough and methodical examination, unless the condition of the patient is too bad, is of great help. The system which is affected most should though be examined first, but that never to the exclusion of others.

Clinical findings are more important than laboratory data.

The rapid development of the appliances and ready made laboratory aids, are often too tempting and sometimes dazzling to the young students and doctors to distract their attention from the study of valuable clinical material. Unfortunately this lack of clinical eye, entails the necessity of incurring expensive laboratory investigations. These laboratory data at times instead of being aids, tend to dictate a diagnosis. Though by this the real importance of the laboratory aids of value, is not made light of.

The supreme importance of clinical eye in doctors of our poor country.

In a poor country like that of ours, where facility of laboratory aid is remote it is time already that we take note of this untenable position of too much dependence on laboratory for

1· Young (1937) Brit. Med. Jour. May 22nd. p. 1059.

diagnosis. If we can read and read well the clinical findings, and develop a clinical eye which is often a truer guide in coming to a diagnosis, than the laboratory data, we shall have a greater chance of being successful in practice.

Think of the patient as a whole, importance of individualising.

Specially in acute diseases we are apt to forget the importance of the person as a whole. "There is no separation of man from his disease or of disease from man. It is the patient and not the typhoid bacillus that presents to us the disease typhoid fever[2]. Here too, we should consider "the patient as an individual reacting to myriad of conditions of which the disease itself is but a part"[3]. One should also profitably bear in mind that, as no two faces are exactly alike, so also are never two human systems similar. Even brothers and sisters of the same parentage, brought up under identical conditions may have very dissimular constitutions.

Better have a written plan and details of treatment.

Before starting actual treatment it is better to have a plan, based on the diagnosis and indications, and with a mind to eradicate the disease, wherever possible, instead of treating symptomatically. One should know the limits of therapeutics and predict of likely outcome of treatment gained on experience only, because to expect to accomplish an apparent impossibility is to court failure and thus lose the confidence of the patient and his relatives or guardians. This well-planned line of treatment should not be altered unless there are serious reasons, and should be given trial for a reasonably sufficient length of time, to produce some structural change in order to gain any favourable functional manifestation.

Simple, cheap but efficient treatment should be aimed at

Simplicity, practicability and above all cheapness are important considerations in treatment, particularly for rural and general practice. It is essential that cheap and effective remedies are chosen, so that the patient is given the benefit of maximum of effectiveness with the minimum of cost. The indiscriminate use of patent drugs, notably with secret formulae be better avoided.

Types of Treatment :—

The types of treatment may be *radical*,—when it tries to remove the very cause of the disease. Though this is only possible at the earlier stages when definite structural alterations are not likely. Understanding of the exact pathogenesis of diseases is essential for successful radical treatment. To

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2. Longcope (1932) Bull. John. Hopkins Hospt. 50 ; 4. Jan.,
3. Bailey and Weiskotten (1937) Jour. Amer. Med. Assoc. 109 : 26. p. 2136 . Dec. 25th.

relieve the pain of lumbago, the fibromyositis of the back muscles, by analgesics, while the pyorrhoea alveolaris the root cause, is left untouched, is one of the examples of *symptomatic* and often futile treatment. But when symptoms are troublesome or exhausting, such as an irritating cough, or a tiring pain or colic, they must be relieved, along with radical treatment, otherwise they will make the patient weak through sleeplessness and lack of rest. But to stop motions of acute bacillary dysentery by opiates, or a cough helping expectoration, may cause trouble, if not disaster. Hence one should know when to interfere and when not to do so. This knowledge of discrimination between salutary and injurious symptoms is essential for proper treatment.

Expectant Treatment involves a policy of non-interference and inactivity guided by the careful supervision and scrutinizing watchful eye of a physician. The therapeutic agents may act *rationally* or *empirically*.

The Plan of treatment generally includes :—

(1) *General Management* :—Conservation of the strength of the patient, which includes details like, good nursing, suitable dietary, ventilation, rest, sleep and so on, should be aimed at.

(2) *Medicinal Treatment* :—Here some overdo, while others do too little, the former group pin their whole faith on drug therapy, while others take them as mere placebo. But the via-media, is the reasonable course.

(3) *Dietetic Management* :—On suitable scientific dietary depends the optimum health and activity of the body tissues and cells and in the human system constitute the major factors of resistance, on which we have got to depend for the cure of diseases. Here the tastes, likes, habits, environment and at times, even prejudices of the individual should be taken into serious consideration. If the person craves for any particular item of food, unless obviously injurious, the safe plan would be to allow a very small fraction of it on the first day, and watch its effects, if nothing injurious or untoward follows, then one could increase the amount gradually and cautiously keeping watch over the likely evil effects of such a diet. In practice much may actually be accomplished by carefully charting out the diet of the patient. Though unfortunately to this neglected, but very important item in treatment, we are not sufficiently mindful.

(4) *In physical theraphy*,—baths medicated or simple, hot or cold, fomentations, poultices, counter-irritants, liniments, exercise passive or active, massage, move-

ments, electric, thermic, various rays and lights are in use. The electrical treatment is not always possible to be administered in many places due to want of scope and means.

(5) *Psychotherapy* :—The mind, in a physically ill body, is as a rule, very sensitive, and naturally craves sympathy and kindness. So a kindly smile and a few words of sympathy, may help in producing a permanent good impression about the doctor, to the latter's credit and advantage. To this the students and young doctors cannot afford to be unmindful.

(6) *Prophylaxis* :—A large part of our practice is usually among persons suffering from communicable diseases. If proper care is taken to check the spread of these preventable diseases, many of the valuable lives otherwise lost may be saved. The burden of educating the public to civic and sanitary sense, should in this land where public health departments are at their infancy, have got to be shared by us, the practising physicians.

(7) *Surgical aid*.—The surgeon's help should always be sought for in all cases of doubt and not uncommonly the physician will be materially benefitted by his valued suggestions.

Promote euthanasia.

Lastly, one should remember the limitations in therapeutics—and when the patient is beyond all human help, his last days or hours of suffering may have to be made painless and bearable, and thus promote euthanasia by suitable analgesics, hypnotics, and others. In the words of a great worker[4]—"In these circumstances instead of still trying to stimulate the flagging vital powers by such agents as strychnine, alcohol and oxygen one should use morphine and, use it freely."

CHAPTER II

INFECTION

When micro-organisms gain entrance into the body, multiply, and cause deviation from normal states or bring about frank abnormality in the system, it is called disease.

The newly born human baby's body, orifices and passages are sterile at birth,[1] but in a few hours the skin and the ex-

4. **Hutchison (1936) An index of Treatment. p. 4. Eleventh Edition John Wright and Sons, Bristol.**

Editorial (1937) Brit. Med. Jour. January 2nd, 1937 p, 26.

posed mucous surfaces, become the seat of numerous bacteria, a condition more or less persisting for the rest of its life.

Sources of Infection.—Besides the human beings some lower animals may be sources of a few infections—such as plague from rats, Malta fever from goats, and so on.

Modes of spread.—May be direct or indirect.

Direct method.—Infected person,—convalescent, cured, or contact *carriers,* through their own or relations' ignorance or carelessness may help in the spread of diseases. The bacteria gain entrance through the various cavities and orifices, and according to their natural selection, habits, resistance etc., either succeed or fail in producing disease. Most of the diseases of the naso-respiratory tract, are caused by direct droplet infection. The modern places of amusement, where all sorts of carriers of respiratory disease gather in closed halls, help all the more, in their spread. Open air life is very useful for the prevention and cure of respiratory infections.

Indirectly :—Many diseases occur through food, finger, flies, filth, fomites and fluid. There are numerous bad habits and customs which also are prolific sources of the spread of many infections.

Certain *insects,* such as mosquitoes, sandflies, fleas, ticks, and others, act as *intermediary* hosts (vector) in the transmission of many infections. Recent methods of disinfection of germs from air has been successful partly.

The *path of entrance* of bacteria into the system is of considerable importance in determining their effects on the host, as for example virulent pneumococci when swallowed, may not produce and disease, whereas if they enter and get a foot-hold in the respiratory passages—may cause even fatal pneumonia. Any lowering or resistance, local or systemic, may help in flaring up the virulence of a hitherto checked bacterial activity, to the detriment of the subject, and may thus cause frank illness. It is the resultant of the fight between the bacteria and their products (toxins) on one hand, and the fighting, neutralising, precipitating, and such like defensive power of the human body, cells and juices, on the other, that will determine, if disease will occur or not, in a particular bacterial invasion. In persons of lowered resistance—the bacteria may overcome the systemic defence completely and cause generalised sepsis, whereas a person with good resistance may not at all fall ill to such bacterial activity.

Importance of focal sepsis :—Its importance in undermining the health of an individual is very great indeed. To this we are not sufficiently conscious. For easy understanding of its importance the chapter on pyorrhoea alveolaris may be perused, with some benefit.

Resistance :—As one gains in experience, the more convinced he becomes of the supreme importance of keeping the threshold of resistance of the patient at a higher level. But there is hardly any particular group of items, which determines this hopelessly variable, but supremely important bodily quality called resistance.

It seems to vary according to heredity, age, sex, habits, environments, physical, psychical, endocrine structure and above all to the dietary regime and such other factors influencing the individual. But we know, as practical physicians, that provided there are a good heredity, square dietary, open air active life, without bad habits, environments and excesses, will keep one fit to resist and fight out diseased processes successfully. Any infection, any focal sepsis, however mild or trivial may ultimately add burdens to the system, too much to bear, specially, under any stress or strain, physical, mental, or otherwise.

CHAPTER III
IMMUNITY

There may be various factors in the production of *racial immunity*. The comparative resistance of the Jews and greater susceptibility of the Nepalese to tuberculous infection are good examples. Personal immunity lies, not only in the integrity of the skin, mucous membranes, but also on the optimum activity of the various defensive cells and juices, biochemical hormones and normal secretions etc. As examples one may mention of the antiseptic action of the normal acid urine and of the gastric acidity.

General Immunity :—In childhood we are particularly prone to suffer from several diseases of which measles, whooping-cough, diphtheria, tonsillitis, summer diarrhoea and so on are common. Most of us reach the adult age having suffered from all these and other infections which may appear in such mild or abortive forms, that though a clear diagnosis could not be made, yet they confer immunity, all the same. This may be said of poliomyelitis, mumps, and such other conditions. But there are some diseases like pneumonia, erysipelas and so on, which make the patient prone to repeated attacks.

Local Immunity :—Besredka was one of those who advocated local immunisation. His idea was to immunise the vulnerable cells of a particular tissue, through proper contact with the antigen, as for example bilivaccines and oral vaccines. The former are used for prophylactic, the latter for curative as well as prophylactic purposes. Local use of antivirus is another example of an effort to produce local immunity.

Acquired Immunity :—There are numerous agents which act *non-specifically* in the production of immunity. They probably work when injected by (1) stimulation of the reticulo-endothelial tissues, (2) activation of the cells and juices, (3) improving the detoxicating function of liver, (4) fixing the hitherto circulating unfixed antibodies at the site of disease.

These substances producing non-specific stimulating action may be, *foreign proteins*—like protein of milk, casein, peptone, serumproteins, vaccines, chemicals with vaccines, bacterial, protozoal, or leukocytic derivatives, nucleinates, cinnamates, and so on. They may be *heavy metals*, like manganese, silver gold etc., or like iodine—*certain oils with tissue-irritant properties* like turpentine, camphor, creosote in olive oil, and many others. Strictly speaking metals and their salts, do not come in this category, but they do stimulate the system to form better defence, hence they are included here.

Some of the commoner conditions suitable for non-specific therapy are :—

(1) Cases of prolonged mild or moderate pyrexia of unknown origin. (2) Chronic inflammatory states like chronic arthritis, fibromyositis, neuritis, and such others. (3) Chronic inflammations of the pelvic organs in females, in gynæcological practice.

(4) Diseases of the skin.

(5) Such diseases like filariasis, chronic resistant inflammations and so on.

These non-specific agents are administered by injection, for the skin and mucous lesions, better intradermally or subcutaneously, for other purposes intramuscularly. To get very high reaction some of the bacterial products may have to be given per vein, in one to five million or lesser doses.

Recently pyrotherapy—is being used to cure syphilis[1] and gonorrhoea with encouraging results.

Commoner contra-indications to non-specific therapy are :—

Allergic states, asthenia and too low blood pressure, any cardiorenal disease, all types of tuberculous infection, diabetes-mellitus, pregnancy, and so on.

VACCINE THERAPY :—

Vaccines are generally normal-saline suspensions of bacteria killed by slow heat, containing either 0.5 per cent carbolic acid, or tricresol or formalin.

USES :—

They may be used for curative, prophylactic and rarely provocative purposes. For prophylactic purposes—typhoid, para A and B, cholera, dysentery, plague vaccines are com-

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1. Ohio. State. Med. Jour.—1937. 38. p. 803.

monly used. Provocative use is mainly in chronic or latent gonorrhoea. Most vaccines may, more or less, be used for curative purposes.

TYPES OF VACCINES :—

Autogenous Vaccine :—These aim at specific immunity, though there is also a non-specific element in it. To be effective, the culture media should be ideal, and isolation of bacteria, preparation, dosage etc. of the vaccine, proper and accurate

(2) *Stock Vaccine* :—They contain only homologous bacteria from different sources, and are not so effective curative agents as autogenous ones. They are used extensively—but with variable results. Among numerous other types of antigens sold in the market under various names some important ones are—*serovaccines or sensitized vaccines, detoxicated vaccines, phylacogens, immunogens etc.*

A FEW PRACTICAL POINTS ON VACCINE THERAPY :—

How given :—As a rule vaccines are given sub-cutaneously, except in rare cases where they are injected intra-venously to produce a brisk febrile reaction, as in some resistant form of filariasis, syphilis and so on. But they act mostly non-specifically in these latter diseases.

Dosage, reaction, interval etc.—The *dosage* should be so chosen that in acute cases no reaction is produced, but in chronic cases, for which the vaccines are mainly used, a mild reaction, local at the site of injection, focal at the place of disease, and a general systemic reaction in the form of mild fever, malaise, aches and pains, leukocytosis etc., should be aimed at. But there are so many individual variations, that vaccine injections should always be started from smaller doses and worked up gradually and cautiously. A brisk reaction may mean either too large a dosage or a very susceptible body, both suggesting a next smaller dose. In acute cases, the *interval* should be about twenty-four to forty-eight hours, whereas in chronic cases it should be three to five days or more according to reaction, indication and so on.

Dosage according to age, sex etc.—Children under six years usually one-fourth, between six to ten years half, from ten to fifteen years two-third the adult dose may be given. In debilitated, old persons or in thin females the dose should be reduced proportionally.

Other methods of treatment should not be neglected :—
Proper medical, surgical and other proved methods should never be neglected while treating a case by vaccine injections, because vaccine therapy is only an additional weapon in the fight against diseases.

One should see that :—

(1) Properly diagnosed, cultured and isolated bacterial vaccine, preferably autogenous— is used. (2) Vaccines older than six months are not likely to be of much use. (3) Hurry on the part of the doctor is bad, so also are too frequent injections of vaccines.

(4) The doctor should not allow vaccines to control him, but just the contrary should hold good.

(5) One should defer the injections, when there is any difficulty, however mild, such as menstruation in woman, mild infections or contemplated journey and so on.

Choice of remedy :—Vaccines are useful in sub-acute and chronic conditions whereas in acute states serum and modern chemotherapy and antibiotics are the therapy of choice.

Sera—confer, when injected, immediate and passive immunity to patients. Their uses are curative as well as prophylatic.

They may be—

(1) *Antitoxic Sera.*—as those against diphtheria, tetanus; gas-gangrene and others. They act by neutralising the toxins, circulating and fixed in the tissues.

(2) *Antibacterial Sera.*—obtained by immunisation with actual bacteria. They are supposed to act against the bacteria, as for example, anticoli serum, etc.

(3) *Both antitoxic and anti-bacterial sera*—for example :—polyvalent anti-streptococcus sera of various types (erysipelas, puerperal, etc). anti-staphylococcus, anti-dysentery, anti-meningococcus, anti-cholera serum, etc.

(4) *Convalescent Sera.*—are used for curative and prophylatic purposes specially in measles, etc.

(5) *Haemostatic Sera.*—are usually tissue extracts like cephalin, sometimes, mixed with horse-serum or other substances.

(6) *Placental extract* is useful in measles and haemophilia.

How given—Sera are generally given intramuscularly, subcutaneously, intravenously or intrathecally.

SERUM REACTION :—The reactions after the injection of all sorts of therapeutic sera vary very widely in their severity, time of onset, frequency, etc., depending on the susceptibility of the subject, type and amount of serum injected, whether it is repeated or not, and so on.

The reactions are :—

1. *Serum shock*—or spontaneous hypersusceptibility with immediate reaction, may prove even fatal. These subjects are usually sensitive individuals intolerant to foreign proteins.

They are either the subjects of asthma or belong to the family of asthmatics and show various types of sensitiveness, or have received the injection of horse serum previously, or subjects of status lymphaticus or hay fever or prone to urticarial attacks. So, before sera are injected one must ascertain the above details and test the sensitiveness of the individual and when found sensitive by the skin reaction test, they should be first desensitized and then serum given.

.Preventive.—Desensitize the patient by giving gradually increasing doses, beginning from one drop of serum, diluted one in ten of sterile normal saline, at quarter hourly intervals, till the patient shows no reaction, even after the injection of one c.cm. of the diluted serum. Then, gradually the undiluted serum should be injected, begining from onetenth of a c.cm. and the reaction watched. If nothing untoward follows, then it may be given in increasing doses.

Either, injection of atropine with adrephine and calcium gluconate or the oral administration of calcium and ephedrine with tincture belladonna, allowing enough time for their action to take place, when precedes the administration of serum, this hypersensitivity is much less or diminished materially.

N.B.—*Before giving all sera specially when given intravenously or intraspinally, the sensitiveness of the patient should always be tested.*

Curative treatment;—Of this very serious and even fatal condition lies, in the prompt injection of ½ to 1 c.cm. of adrephine with atropine sulphate 1/100 to 1/200 gr. and should be followed by the injections of calcium gluconate etc.

(11) *Serum sickness.*—This generally mainfests itself on an average of six to ten days or rarely earlier following the last dose of injection of serum. In the concentrated sera the amount of foreign protein being very little, through elimination in the process of concentration, this reaction is generally very mild too.

The symptoms of serum sickness are swelling of the lymph glands and moderate leukocytosis, followed by leukopenia, skin rashes of various types usually urticarial or erythematous with itching, local oedema, fever, malaise, gastro-intestinal disturbances, headache, pain and swelling in the joints, conjunctivitis and so on. Retention of water and chlorides, without albuminuria, delayed coagulation of blood and others are also sometimes encountered. Various types of paralysis of the nerves are also met with.

The condition usually lasts for about one to four days and may rarely extend up to weeks.

Preventive.—If a mixture containing proper doses of calcium lactate, tincture ephedra vulgaris, tincture belladonna,

with potassium citrate and bromide is given thrice daily after food, a day or two preceding the expected time of onset of serum sickness, thus allowing their full action to take effect during the expected time of serum sickness, and continued till it passes off.

Curative.—Once the symptoms have begun, injections of adrephine, calcium gluconate and atropine, in proper doses, tend to ameliorate the symptoms. For the itching, one per cent carbolic acid solution in lotio calamine, as a local application, is useful. But the preventive treatment, as indicated above, should preferably be followed in all cases, and thus this condition made impossible to develop. Sera are being replaced by chemotherapy and antibioties with excellent results.

CHAPTER IV

FEVER

Clinical Significance and Treatment.—Fever is one of the complex responses of the human system of which the raised temperature is one of the indications only of its fight against the infecting microbes and their toxins.[1] Types of temperature give us a clue as to the probable nature and character of the infections. Though the pathogenesis of these different types of temperature such as of hectic nature in pus under pressure, continuous in pneumonia and so on, is not clear, yet in all probability they depend upon the balance and the resultant of fight between the invading bacteria and their toxins on one hand and the antitoxic elements of the host on the other, which are somewhat antagonistic to each other.[2] That this is true to some extent is proved by the atypical or slight pyrexia resulting from even pneumonia in alcoholics, cirrhotics. nephritics, diabetics, in subjects of cancer, chronic ascites, etc. and in other persons of much lowered resistance as in K.A.[3], to which they not uncommonly succumb. This raised but atypical slight fever usually means a feeble response on the part of the body. Unless very high above 106°F. and pro-

* Those Interested in elaborate study of the mechanism, metabolism diet and treatment of fevers are requested to consult *Calcutta Medical Journal.* Oct., Nov. and Dec. 1928 the serial lectures on the subjects by the present writer.

1. Dhar—(1928) Cal. Med. Jour., October.
2. Dick—(1923-1924) Jour. Am. Med. Ass. (1923) Vol. 81, p. 1166. (1924) Vol. 82, pp. 265, 203, 544.
3. Dhar—(1937-38) Transac. Med. College reunion 1937, and 1938-39.

longed, fever generally means brisk production of antibodies and the system with fever may be compared to the armament factory of a nation, working day and night under strain of the war. In other diseased processes as in diphtheria, though the temperature is not high, the soluble exotoxin, unless properly neutralised, may prove fatal in a large number of patients. We have got recently some very potent chemotherapeutic remedies against a few of the commoner pathogenic agents, but, for their proper employment an exact diagnosis as to the causative microbic agent appears essential, as the action of these effective therapeutic agents is more or less specific. For the temperature, ice cap on the head, tepid bath, sponging etc. are of signal use.

The Effects of Fever on Heart and Circulation.[4,5]—The effects of the raised temperature and those of the bacteria and their toxins are a transient rise of blood pressure at the stage of chill to be followed by a persistent fall, quickening of the pulse-rate, muffling of the first sound of the heart and so on. In prolonged fever with toxaemia, there might be present a variable degree of myocardial degeneration. Irregularity or extreme bradycardia etc. may be of serious import. Cyanosis, dyspnoea, and cold extremities mean failing circulation.

Principles of Management.—The most important line is to combat the bacteria and their toxins by specifics where available such as sulphonilamides in streptococci, sulphadiazine in gono, pneumo and meningo-infection and sulphathiazole in staphylo infections. In plague and bacillary dysentery they appear also to give encouraging results. Sera, vaccines, convalescent blood, phage etc. should be properly given. One should mention "it is not the heart that fails in acute infections, the peripheral circulation collapses, so that the heart finally has no blood to pump. The condition is analogous to secondary shock". This holds good for almost all other acute infections than rheumatic fever, and diphtheria, as in both these conditions the myocardium is directly damaged. All recent works tend to indicate that the treatment of the muffled 1st sound lies not in strychnine or digitalin[6] but as the heart has not enough blood to pump upon, saline, glucose intra-

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4. Fishberg—(1940) Heart failure 2nd Edition, p. 657, and p. 810 (Lea Febigers Publication).
5. Bierman and Fishberg—(1934) Jour. Am. Med. Assn. Vol. 103., p. 1354.
6. Romberg—(1921) Krankenheiten Des Herzens 3rd Edition (Stuttgart) p. 485.

venously where possible or subcutaneously, better orally where admissible, plenty of fluids[7], also cardiovasomotor stimulants like camphor-in-oil or ether, coramine cycliton etc. may be of some use. Intravenous glucose is useful for the myocardium, with or without insulin.

Respiratory.—Fever raises the rate of breathing per minute and in respiratory system involvement there might be cyanosis, dyspnoea etc. There may be other effects also according to the circulatory adequacy or inadequacy and the state of the heart.

Treatment lies in giving optimum rest and facility by suitable posture, making the patient inhale oxygen best through the tent, failing which by intranasal catheter inserted 4—6 inches inside the nostril at the rate of two liters per minute.[8] Injections of glucose may act indirectly through sustaining the heart. As a respiratory stimulant strychnine in suitable doses is useful indeed. In the absence of oxygen an open air regime is essential. The nostrils, throat and pharynx need care and attention so that their obstruction may not interfere with breathing and other functions.

Secretions and Excretions.—*The Urinary system* is one of the main channels of excretion of the toxins. So an efficient working of the kidneys, by enforcing water to ensure about 50 ounces of urine is of great use. This reduces toxæmia considerably. The *skin* should be kept active by suitable sponging, cleanliness and by plenty of fluids. But much more important is the constant centripetal impluse to the brain of high cutaneous temperature in fever patient, thus keeping the brains wakeful which causes in its turn insomnia, leading to delirium, coma etc. The best way to combat this is *either cool or cold bath, cool sponging every few hours when the temperature is above 103°F. or tepid sponging in cases of lower temperature, every few hours.* This sponging or bath raises blood pressure, increases urinary output, and ensures sleep, the most important recuperating agent in acute febrile illnesses. As a routine, except where even slight exertion may prove dangerous, the patient should be sponged every 12 hours or at least once a day in cold weather, but in febrile cases twice or more frequently as indicated above. *Friction* of the skin should always be an important item in bath or sponging because this is the most beneficial efficacious agent to help circulation, flushing of the skin and to ensure sleep etc.

Gastro-intestinal system :—There might be bad *teeth* or they may be rendered worse through want of proper care and

7. Warfield—(1946) Jour. Am. Med. Ass. Vol. 106, pp. 892.

8. Dhar—(1939) Medical Treatment in General Practice etc., Pneumonia p. 74.

chewing. They should be carefully cleansed preferably by brushing, wherever possible, with suitable paste etc. twice daily followed by massaging of the gum margins. In patients too ill or low or unconscious the routine cleansing with the finger wrapped by a piece of linen soaked in boroglycerine may be suitable. But this need be done after each feed. Vomiting and nausea should be dealt on the ordinary lines and according to the cause.

Anorexia and dry tongue may be more a creation of the doctor by not forcing enough fluid in a dull or semi-conscious patient. Food should gradually be added and if required coaxed gently according to indication. Toxaemia of the patient may be mainly responsible for the coated dry tongue and anorexia, for which besides specifics, internal and external, hydrotherapy is one of the principal agents to combat with.

Constipation may mean dehydration and absorption of all water from the gut or very little diet, or toxic paraesis of gut and requires management on suitable lines. To ensure one motion a day may be essential. Enemata are better for this purpose than any laxatives specially in long continued fevers or in those with gastrointestinal involvement as in typhoid fever group. For the details other works should be consulted. *Diarrhœa* might mean too much of disproportion in sugar or roughage in diet. It may mean local infection of the gut or hyperperistalsis. As a channel of excretion of toxin, diarrhoea may mean undue toxaemia, as in some cases of enteric fever. There might be many other causes for it also, which should have to be treated according to the cause and not by indiscriminate use of intestinal astringents. It is better to allow a salutary diarrhoea to go on, but care should be taken to see that it does neither cause undue debility nor interfere with the sleep and rest of the patient.

Metabolism[9]—Heightened temperature and toxæmia increases catabolism. Increased creatinin output indicates excess of endogenous metabolism. Through the economy of nature in a semistarved or inadequately nourished fever patient who on a conservative regime gets 1000 calories in the maximum per day, with hopeless inadequacy of fluids, burns and consumes his body fat first, the least important article in the economy of nature, then the skeletal muscles, then the brain, the heart muscle and other vital tissues lastly. No one can see and calculate mathematically what disaster may follow prolonged starvation in long continued fevers, like enteric, tuberculosis, etc. Though an adequate dietary may not be vitally important in short fevers, it is so for the long continued ones. An adequate dietary to keep balance between output and in-

9. Dhar—(1928) Cal. Med. Jour., Nov. 1928.

take appears vital. Protein sparers like glucose, and other carbohydrates are of use too. Potatoes, rice, bread, sugars in moderation should always be exhibited according to the taste, liking, and power of digestion and assimilation of individual patients.

Vitamins are also needed in greater proportion than under normal states. This should never be lost sight of as they are of signal value in raising the threshold of resistance of the patient. If properly and judiciously fed, anorexia and coated tongue often disappear and the toxæmia improves too. The popular fallacy of "feed a cold and starve a fever" should preferably be "feed the fever and starve a cold".

Water balance in fever patients :—Normally we require about 1500 c.cs. for urine, equal amount as insensible perspiration in colder countries and some through breath as water vapour, some for metabolism etc. Normally in health we consume about 10—15 gm[10]. of Nacl. In fever, the loss through insensible perspiration or as demonstrable perspiration may amount to several pints[11], specially in hot days this is about one and a half to twice as much as in cold days. This is very important from the standpoint of treatment. Because water is the only therapeutic agent capable of washing the individual cells, hence all effort should be made to ensure about 50 ounces of urine from all fever cases. This is very difficult to accomplish actually specially in the presence of high temperature and in hot days unless the patient is made to take about eight to twelve or even fifteen pints of water daily. Where undue sweating or extreme dehydration takes place, injections of saline, or oral use of sodium chloride in two to four gram doses daily may be necessary. In unconscious or semi-conscious patients, this point of giving enough water is of utmost importance, and not uncommonly patients die from typhoid fever and in other long continued fevers only as a result of dehydration and lack of fuel, which is the duty of any physiologist to enforce. A doctor who fails to do this either lacks in practical knowledge or does not take things with that seriousness which, with these vital points involving the question of life and death of the patient, demands.

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10. Chopra—(1938) Ind. Med. Gaz. (Physiology in Tropics) Jan. pp. 45. and 42.
11. Maddock and Collar—(1937) Jour. Am. Med. Ass. Vol. 108, 2nd Jan. pp. 1-6.

Extra fluid and nourishment by intra-nasal introduction of Ryles Tube.[12]—This is specially useful in all toxic cases, either conscious or unconscious, in enteric fever, subtertian malaria, pneumonia, meningitis, confluent smallpox, and other conditions of intense toxæmia, dehydration, associated or not with delirium or coma etc. When the patient is violently delirious indicating profound toxæmia, his hands and feet need be fixed up before the introduction of the Ryles Tube and also to maintain it in position. If co-operating the patient is given sips of water to drink and the tube well lubricated introduced through one of the nostrils and as soon as it reaches the larynx and is visible through the open mouth, he is given sips of water to drink, the swallowing movement facilitating the entry of the tube into the œsophagus while being pushed down all the while. If the tube goes the wrongway into trachea the patient has not only a fit of coughing thus expelling the tube but also when the proximal end is dipped into a cup of water bubbles come out thus indicating that the distal end is not in the stomach. To the proximal end one may attach a saline bulb, in its absence a funnel or, the tapering end of the outer tube of an all glass glycerine syringe of 4 ounce or 2 ounce capacity through which, food mostly liquids like milk diluted, citrated, peptonised, or milk and egg beaten together, milk with lactose, butter milk, glucose water, saline glucose, or plain water and such like food and drink which would pass easily through the small appertures of the Ryles tube may be given preferably by drip method by attaching a drip canula in the connection of tubes. The quantity of food and drink given should be measured and noted down, and with proper judicious consideration as to the suitability of a particular article.

By this contrivance in one of my violently delirious typhoid patients who could not be made to take more than fifty to sixty ounces of fluid daily, we could easily give gradually upto 125 to 140 ounces of food and drink daily thus the toxins being washed out as evidenced in the increased output of urine, his delirium gradually became less violent to disappear in about ten days time; the very quick pulse rate gradually slowed down, and after continuous internal and external hydrotherapy in the form of tepid to cool sponging given every 4 to 6 hourly when the temperature was above 102°F thus promoting sleep, once an apparently hopeless case made an uninterrupted recovery, not a small achievement.

The tube may be kept in one of the nostrils continuously for 2—3 days or even longer. After a suitable period of

17. Ransome, Gupta etal (1944 Nov. 4) Brit. Med. Jour. p. 594.

interval it should be brought out gently, cleaned, washed, boiled, lubricated and reintroduced preferably through the other nostril. Well lubricated Ryles tubes properly introduced and kept fixed by adhesive plaster to the cheek causes neither damage nor much trouble, though the patient always tries to pull it out, hence the requirement of fixing his hands and feet where essential. This has proved life saving in several of our cases. One case of lobar pneumonia admitted under me late, highly toxic, dehydrated, in semiconscious stage got cured by Ryles tube feeding and hydration and proper supply of oxygen through a catheter in the other nostril coupled with penicillin therapy.

Nervous system :—As already said, our sensation of heat and cold interpreted in the brain are mainly derived from the skin, and continued pyrexia has a deleterious effect in keeping the master mechanist, the brain, wakeful with ultimate disastrous results. The best way to break this vicious circle is through the skin by giving cool sponging or bath or by some suitable agent like ice cradle etc. We can in health sleep after a cool bath in the morning having passed through a wakeful hot night. This analogy should hold good in all our fever patients. This vitally important point is not generally realised by practising physicians. Delirium,coma, insomnia are best combated through sleep which is prevented by the high cutaneous temperature, toxaemia, etc. These in their turn are ideally combated by suitably applied internal and external hydrotherapy, specially in *typhoid group of fevers.*

Toxaemia also is best dealt with, besides, by specifics and by hydrotherapy, internal and external. The old Edinburgh fever specialist Dr. Kerr used to say that "with skin acting fairly well, a clean bowel and increased diuresis, such a condition as typhoid state rapidly disappears and restlessness and sleeplessness and the like are seldom observed". The effect of proper cool bath or suitable sponging on :—

1. *Nervous system*—induces sleep and gives rest to the taxed brain.

2. *Vasomotor system* :—The blood pressure rises and the peripheral vascular failure, one of the commonest causes of death, is averted.

3. *Kidneys* :—The urinary output is increased and the toxæmia is thus reduced if associated with simultaneous internal hydrotherapy.

4. *Respiratory* :—The touch of the cold water on the skin causing a deep breath helps to prevent passive congestion of the lungs, also assists the circulation and heart by inducing a negative pressure through venous suction into the thorax.

5. *Gastro-intestinal symptoms* are also kept in some check —notably when hydrotherapy is instituted from the very begining of typhoid fever and other fevers.

6. Besides, it prevents bed sores and reduces the high body temperature which in its turn conduces to resting of the brain even to the point of inducing sleep.

Most of the acute fevers against which we have no specifics generally improve under the following regime:

I. Rest.
II. Proper Nursing.
III. Elimination of toxins by hydrotherapy, internal and external.
IV. Proper Diet.
V. Fresh Air.
VI. Relief of symptoms and commoner complications as they arise.
VII. Specifics.
VIII. Prophylactic.

1. *Rest*[13].—Every patient showing temperature should always be confined to bed and with as much sleep and relaxation as possible. How much of tissue destruction is economised by sleep will be evidenced by the fact that at sleep an adult eliminates 22 grms., of carbondioxide, at extreme muscular relaxation 31 grms, and 38 grms.[14] under ordinary rest in bed. None the less important is the lessening of the load on the heart and other vital organs in toxic conditions like diphtheria, pneumonia and long continued fevers. Mental rest and freedom from worries are very important to win a grim fight against acute infections.

Bed :—As done in typhoid cases, a single bed accessible from all sides, with suitable mattress (gadda or toshock) covered by an oilcloth, the latter covered by a bed-sheet may serve the purpose all right.

Covering :—In the matter of covering the patient, usually the guiding principles should be the nature and degree of illness, the climate, prevailing temperature and weather conditions. A fever patient, unless very carelessly exposed, seldom catches chill, and one finds more patients with undue excess of covering than otherwise. One very frequently sees a tightly bandaged chest, the thing least wanted, with cataplasma kaolini in a patient with lobar pneumonia covered with a quilt and doors and windows closed, for fear of a cold. What a tragedy and misunderstanding of physiological principles of healthy living!

Room :—A sunny, well-ventilated, quiet room—preferably in the first floor having an adjoining bathroom is an ideal sick

13. Meara (1921). Treatment of Acute infectious Diseases 2nd Ed. p. 2,
14. Dhar (1929). The Antiseptic, April, Jubilee Issue.

room. But during the hot days, the doors and windows should be closed, and coolness and quietness ensured during the day, and the doors etc. flung open after dusk. Extra furniture, curtains etc., are better removed.

II. *Nursing*.—In communicable infectious diseases in adults or in children, the patients should be *isolated* and instructions written down either to the mother or nurse or some suitable sensible person looking after the sick. If the attendant or the nurse has not suffered from that particular infection being attended to, they should either be *inoculated* as in typhoid, cholera or smallpox etc., and in other conditions *all preventive measures discussed under* that heading should be undertaken with utmost care. Hands and face of the attendant should be cleansed and washed and mouth gargled with water to prevent droplets from acting. One in thousand hydrarg perchlor solution is suitable for this purpose. *Overalls* and in very infections diseases like smallpox and plague, *masks* are of use too.

The patient's skin should be sponged with particular attention to the pressure points. Regular dusting and powdering is essential. During such sponging cold blasts should be avoided.

The mouth of the sick should receive proper care and lack of this not uncommonly leads to parotitis in typhoid and other fevers. Boroglycerine with some menthol in it is a suitable cleanser of the mouth. After each feed the mouth should be rinsed with some deodorant solution. It promotes salivary secretion, tending to prevent parotitis. One dram of soda bicarb to a pint of water forms a good mouth wash.

Nose :—Nasal obstruction leads to mouth-breathing with all its associated dangers. The nostrils should be kept clean by encouraging to blow them out where possible, otherwise in infants and extremely ill patients a swab-stick dipped in boroglycerine used, applied to the lips and the nostrils to prevent crust formation. Epistaxis should receive proper treatment.

Eyes :—They should be kept clean and in the absence of any disease, liquid paraffin instilled into them every 8 or 12 hourly. In any congestion etc. a four per cent zinc sulphate solution may be dropped into the eyes. In more serious states the help of an eye-specialist may be indispensable.

III. ELIMINATION OF TOXINS ETC.—Already stress has been laid on internal and external hydrotherapy. The only genuine practical evidence of adequate external hydrotherapy consists in ensuring the passage of about fifty ounces of urine by an adult fever patient, a point which cannot be too strongly emphasised. The bowels should be kept regular and the skin

freely active. Already suggestions have been given for practical attainment of these points.

IV. DIET.—The very low caloric diet usually granted to our fever patients may not be very unsuitable for illness of short duration. But for long continued fevers they are the sources of other troubles besides by causing a much lowering of resistance, a point vitally concerned, in winning the fight. To a typhoid patient one may give, soft rice, potatoes mashed, puddings etc., when the patient is not too ill but in serious cases the following liquid diet of 2,000 calories suggested by Dr. Napier of the School of Tropical Medicine Calcutta may be given, but there are practical difficulties in giving them to toxic patients.

Serial No.	Articles	Quantity	Protein	Fat	Carbo-hydrates	Calories	Remarks
1	Milk ...	40 ozs.	35.7	41	54.5	720	
2	Chicken Soup ...	4 ,,	12	1	2	65	
3	Oranges ...	6 (such)	4.5	0	40.5	180	
4	Sugar ...	4 ozs	0	0	113	452	
5	Glucose ...	4 ,,	0	0	113	452	
6	Bread ...	2 ,,	4	0.5	30	140	
Total		60	58	42.5	353	2,000	

If the patient can take polysaccharides, starches may be added. Eggs, fishes properly mashed and prepared I have given to many of my typhoid patients with judicious discretion without any untoward symptoms, and more often with quicker recovery and much shorter convalescent period.

Vitamin contents like Esdavite or Abidol C capsules, and numerous other multivitamin tablets or in the case of children Nestrovit liquid should be exhibited from the very beginning. Regular routine use of C vitamin from the first week in typhoid patients seems to have reduced the incidence of hæmorrhage in them. *Water* should be given to the extent of at least 8 to 10 pints a day, notably in toxic cases, and that sufficiency of it proved by the adequacy of urine passed by the patient, as already emphasised.

V. FRESH AIR AND VENTILATION.—Rapidly changing, cool fresh air impinging on the face of the fever-patient improves

his circulation and appetite, restlessness lessens and he sleeps better, these are advantages not within the power of any medicine to achieve. The sources of droplet from and to the patient are diluted by pure air and thus the risks of spread are minimised. From personal experience one has found that in our tropical country all patients, specially with respiratory involvement, are best treated in the open verandah even during the cold season. In hot days and in the rainy season the heat and the rain water should be prevented from working on the patient, but ventilation should never be sacrificed.

The unreasonable fear of the lay public to the open air life and of exposure is certainly without any scientific basis and should be impressed on them. One should remember that "we are likely to forget that we take in as much air by weight per day as we do of food."[10] We medical men are not sufficiently conscious about the enormous possibilities in respiratory system which may be fully utilised during our health and disease. Certainly pure air is of inestimable value to the patient as well as to the healthy specially at the period of growth.

VI. RELIEF OF SYMPTOMS OR COMPLICATIONS.—*Head-ache and malaise* are the commonest symptoms of all fever patients. The initial malaise and mild aches require very little more than a powder containing the following: Caffein Citrate gr. i.; Phenacetin gr. ii.; Sodi Bicarb upto gr. x.; besides this if seen early and with constipation a grain of Hydrarg Subchloride might be added to the above with good results. If associated with high temperature an ice-cap on the head might be of relief.

Headaches of meningitis require lumbar puncture and cerebral malaria injection of Quinine and so on. In *headaches of blood loss or low blood pressure*, besides giving of fluids and medicine the foot end of bed might have to be raised to assist cerebral circulation. But the simple symptomatic head-ache may be relieved by a cool quiet darkened room and a powder like the above. *Headaches of toxaemia* demand specifics and elimination. *Other medicines* like cibalgin or morphine are indicated for more intractable conditions. Sometimes *headaches of raised intracranial pressure* are relieved at least temporarily by rectal retention enema of four ounces of 25 per cent mag-sulph. solution or intravenous injection of 50 per cent glucose 25 cc. with equal amount of 2 to 4 per cent saline. They all act by altering tissue osmosis.

Hyperpyrexia:—Where the cause cannot be removed as by Quinine in malaria, massive doses of Salicylates in rheumatic fever—the best treatment is either *cold pack or ice cradle, or cold bath, or frequent cold sponging according to suitability.* For the feeble or those with weak heart etc. frequent cool or

cold sponging, or, better still, ice-cradle, may be useful. An ice-cap on the head, or in its absence a big folded sheet or turkish towel wrung out of cold water should cover the head to be fanned constantly with a hand fan. Cold water may be poured over the head in a small stream continuously. In intractable cases these may be coupled with a few ounces of iced rectal saline retention enema. As a word of warning one should remember that the circulation should be of proper type to be able to stand the strain of shifting and the temporary shock at the first touch of cold water on the skin. It is better to go to intense cold gradually starting from a comparatively higher temperature thus minimising the mild shock.

Insomnia :—This may be due to toxaemia, worry, anxiety, diarrhoea, cough or pain etc. Wherever possible these should be removed and eradicated. Insomnia is important because when prolonged may cause delirium leading eventually to coma. The efficacy of cool sponging to relieve symptomatic insomnia of prolonged pyrexia has already been stressed. If fresh cool air, sponging, removal of pain or discomfort and reduction of toxaemia are not sufficient to induce sleep, we might have to take resort to *medicines*. Five to ten cc. paraldehyde injected in the gluteus is useful as a hypnotic.

Hypnotics :—An ideal hypnotic is paraldehyde in one to two dram doses with extract glycerizæ liquid and syrup lemon one dram each, orally may not be disagreeable enough, but its odour is disliked and is difficult to disguise. A *retention* enema high up rectally in 3 to 4 dram doses of paraldehyde with equal amount of starch mucilage shaken up together may be of use . Ten to tewenty gr. doses each of *Chloral hydrate* and *Potbromide* may be also of use. *Barbiturates* sold under various patent names, like Dial, Sekonal, Ipral-calcium, Luminal, Soneryl etc. usually in *one to three* grain doses are effective. Didial is a stronger hypnotic. But they appear to have somewhat depressing effect on the respiratory centre hence are not very suitable in the infections of the above system notably when used in repeated doses in succession. One teaspoonful of Peacocks bromides is useful and harmless.

Insomnia of initial aches and pains in all acute infections is best relieved by the Caffein, Phenacetin, Aspirin powder coupled with a gr. or two of Barbiturates and Hydrag Subchlor when constipated. Once hypnotics are prescribed, it is essential to see that good sleep and the desired rest, so essential for a fight, is attained. Due consideration should always be given to any hypnotic to which *the patient is used* and acts well on him, because this might do away with the intolerance of some persons to new and unused hypnotics given for the first time.

In excitable and maniacal states injection of suitable doses of Hyoscine Hydrobromide 1/250 gr. with or without Morphine in ¼ to 1/3 gr. doses may be helpful. For insomnia of pain Morphine and Atrophine or Analgesics may have to be given. Dilaudid or Omnopon, Codeine may be used instead of Morphine. One of the useful sedatives in fever patients with hypertension is five to ten grain doses of powdered root of Rauwolfia Serpentina.

VII. *Specifics*[14].—This is a very big chapter, only mention may be made of biological products like sera, vaccines, phage, recent advances like sulphonamides, penicillin, streptomycin etc. They should always be given due consideration in all cases of fever.

VII. *Prophylactic*.—This is an important item in all contagious diseases. The thermometer, excreta, sputum, fomites—all should be properly disinfected. Usually all gastro-intestinal diseases are transmitted by either alone oı in combination of fingers, food, flies, fomites, filth and fluids, and hence due care should be taken against all of them. Droplet infections, and virus affections also demand proper care. For the details other specialised works should be consulted.

CHAPTER V

SPECIFIC REMEDIES

1. Chemotherapy.

Sulphanilamides :—

"The essential principle of sulphonamide therapy is to maintain *an adequate concentration in blood for an adequate time. The drugs* are rapidly excreted hence an adequate concentration can only be maintainted by frequent dosage. Consequently the drugs are usually given by mouth. Sulphonamide therapy in general resembles salicylate therapy in that it is necessary to give intensive dosage, to produce an adequate concentration and to follow this with a maintenance dosage."[1] For proper *bacteriostatic action* an optimum concentration has got to be maintained in the blood for sufficient number of hours otherwise in *subtherapeutic doses sulphonamides* appear *useless or partially useful only, whereas when adequate dosage is kept up and evenly spaced every* 4 *to* 6 *hourly, most of the serious infections which caused a large percentage of fatality in pre-sulphonamide days are very ably and successfully treated by these drugs. To give smaller sub-*

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1. **Clark (1940) Applied pharmacology-7th edition p. 585 (Churchill publication):—**

therapeutic doses is to court failure, and thus help in producing sulpha-resistant organisms.

Dosage :—

Orally : The Ministry of Health in England recommends for the *first 2½ to 3 days of illness the following daily doses,* according to age :—

"For infants under two years 3 grams; from 2 to 5 years 7 grams; fifteen years and over 9 grams and should be given *every four hours* night and day during the first few days, and thereafter, if thought fit *six* hourly. For adults the first two single doses may be 2 grams each, thereafter the four hourly doses should not exceed one gram each or a total twenty- four hours dose may be gradually reduced over the next four to five days, the treatment being completed in from 7 to 9 days." In some the treatment may have to be started again after a few days' rest. The above is the daily dosage for oral administration. *Usually all sulpha drugs* are sold in 0.5 gram or about 7.5 grain tablets each.

Injection :—

In *grave cases* and where oral medication is difficult due to vomiting the *soluble injectable* preparations should be given *intramuscularly* in the gluteus, care being taken that no part of the injected material oozes up under the sub-cutaneous tissues, causing necrosis and blisters; this is best ensured by taking a few bubbles of air in the syringe between the solution and the piston. The upper and outer quadrant of gluteus, the site of injection should be massaged with deep pressure for easy dispersion of the fluid injected, thus promoting quick absorption. Fomentation of the part ensures lesser pain. *Injections need be repeated every six hourly because most of the drug is excreted out by that time. Intravenous injection with proper precautions* is suitable and thus tissue necrosis avoided.

Intravenous :—

In very urgent cases or where intramuscular route is not convenient soluble sodium salt of sulphanilamides and similar preparations may be given intravenously, *and should not be mixed with glucose or any other chemical before* injection. It is best given diluted with normal saline or freshly prepared distilled water, both pyrogen free, fresh and diluted up to *at least* 20 *c.c. and at the rate of not faster than* 5 *c.c. of this solution per* 3 *minutes—thus the whole amount of* 20 *c.c. should never be injected in less than* 10 *minutes preferably in fifteen minutes.* Care must be taken to ensure that no

drop of the solution leakes out into the subcutaneous or other tissues, otherwise again serious sloughing may result. *Intrathecal administration is not required as the drug even when given orally adequate therapeutically effective concentration is reached in the crebrospinal fluid to exert proper bacteriostatic action on bacteria in the spinal theca.*

Dosage for Injection :—

For an adult about three to four grams of the soluble (usually sodium salt) sulphanilamide is given initially and half of it subsequently in at least 20 c.c. solution 6 hourly at the begining for 4 to 6 doses until the patient can take tablets orally. The solution should have *belter* 5 *per cent strength* (see. later).

Details of treatment in different infections are summarised from the recommendations of an American committee of experts[2] :

I. *Hæmolytic strepto- infection* (a) *mild or moderate* hæmolytic strepto infection like *erysipelas, mild cellulitis, tonsillitis sulphanilamide* is the drug of choice. *Initially orally* 2 *grams*, subsequently one gram four hourly day and night until five days of normal temperature have elapsed. Subsequent dosage may be reduced after the temperature has been normal for 48 hours according to the discretion of the doctor.

(b) *Otitis-media, cause strepto hæmolytic or pneumococcus or otherwise wherever possible culture of the discharge should guide the therapy, in staphylococcal* infection *sulphathiazole* is the therapy of choice, two grams initially, subsequently one gram every four hourly; the treatment should then be continued in 0.5 gram doses four times a day at least ten days after the temperature has been normal and a clinical cure effected.

(a) *Severe hæmolytic infections such as meningitis, septicæmia, osteomyelitis, severe cellulitis, acute mastoiditis sulphanilamide is the drug of choice*, initially six *grams*, subsequently one gram 4 hourly until the temperature is normal for 7 days, subsequently 0·5 gram 4 times a day for ten days after clinical cure.

2. *Scarlet Fever* :—Rare in Indians, requires sulphanilamide and serum treatment :—For septic complications also the same treatment as in haemolytic streptococcal infection stated above is required.

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2. **Chemotheraphy in infectious diseases and other infections (1941) Jour. Amer. Med. Ass. 8th Feb. p. 513.**

II. *For Meningococcal Meningitis serum is not required* generally, but depends on the doctor's discretion, sulphapyridine, Sulphathiazole or better Sulphadiazine or Sulphamerazine and Sulphamezathine[3] in 4 to 6 gram dose initially, sulphadiazine is said to be the best, then one gram four hourly Sodium sulphapyridine or sulphamerazine or diazine should be used intravenously if oral treatment is impossible; the dose advocated is 0.06 gram per kilogram of body weight, hence an adult of sixty kilo-gram; or one and a half maunds require about 3.6 grams. of the sodium salt made into a 5 per cent solution of sterile freshly prepared pyrogen free redistilled water from fresh ampoules. For this a 50 c.c. syringe is required but to dilute that quantity of salt in less than 20 c.c. would be too high a concentration. *This 20 c.c. should be given in 15 minutes time, care being taken that not even a trace of the fluid leaks into the subcutaneous tissues causing sloughing.* Solutions of sulpha salts should be injected as already said *by itself and should never be mixed either with transfusion blood, or solutions as calcium chloride or glucose soltion or other fluids for intravenous use.*[4] The subsequent doses should be half the initial dose and repeated intravenously every six hours. Oral medication should be started as soon as possible to replace injection therapy. *Intramuscular injections may also be given in above dosage* and frequency.

III. *Pneumonia* :—may be of two types, (1) Primary, (2) Secondary-(1) Primary caused by pneumococci, occasionally by other bacteria, *e.g.* strepto haemolytic (beta), staphylococcus, Freidlanders bacillus etc. Pneumococcal infection is usually lobar 2. Secondary-Pneumonia complicating influenza, measles etc. is caused by mixed bacteria of undeterminate origin. In others, higher types of pneumococci, strepto haemolyticus, haemophylus influenza, staphylococcus, streptoviridans etc. may be responsible and is usually lobular in type.

Chemotherapy is recommended—because it is (1) highly efficacious except in the aged and in chronic disease, (2) effective against all types of pneumococci, (3) may be given without typing, (4) inexpensive and simple to administer, (5) also applicable to most pneumonias by most bacteria other than pneumococcus.

Sulphathiazole is the drug of choice—because of (1) greater therapeutic efficacy, in comparison with sulphanilamide, (2) at least as effective as sulphanilamide, (3) less nausea, vomiting, mental disturbances than sulphapyridine, (4) other unto-

3. Karamchandani (1945) Ind. Med. Gaz. 80 p. 304 9-13. Ibid (Nov. 1945) p.556.
4. Hill and Lauer (1943) Jour. Amer. Med. Ass. p. 9-13, 4th Sept.

ward effect lesser than pyridine, (5) excessive acetylation, hence poisoning, is not encountered as in pyridine.

Start treatment as soon as clinical diagnosis is made sulphathiazole initially 3 grams, then one gram four hourly until temperature is normal for seventy-two hours; when the initial symptoms are severe start with intravenous sodium sulphathiazole in 0.06 grm. per kilo-gram of body weight. This calculated for an average adult Indian means 3 to 4 grms initially, subsequently *half the strength every 6 hours till he can take tablets orally.* It should be dissolved in about 30 to 40 cc. of freshly opened ampoules of redistilled water, or at least in 20 c.c. of solution. The powder of sodium sulphathiazole is kept sterilised in sealed ampoules readily soluble in redistilled water. As already said nothing should be mixed with this solution for injection, *Sero-therapy is indicated* (1) where typing of the pneumococci is possible and homologous serum got, and (2) where chemotherapy for 48 hours fails to show proper response, (3) very severe case clinically with septicæmia where chemotherapy alone has failed. *Serum* should be given in 200,000 units rabbits serum (see serum sensitiveness p. 10) if the infection is serious, may have to give 300,000 units—if not satisfactory repeat 100,000 units 8 hourly but must be serum homologus to the particular type of pneumococcus concerned. *Sulphadiazine in above dosage is the best in pneumonia.*

Penicillin :—Cases not responding to sulpha drugs are very ably treated now by penicillin injection. (See chapter on penicillin). *Precuation in all cases of administration* of sulpha drugs should always be taken and fluids up to 3500 c.c. and more forced in orally or otherwise per day.

2. *Secondary pneumonia*— which is more commonly lobular or broncho pneumonia caused by strepto hæmolytic, staphylo, or Freidlander require sulphathiazole. Initially 4 grams then 1 gram 4 hourly, if this is unsatisfactory give 1·5 to 2 grams, 4 hourly till definite improvement takes place, subsequently one grm 4 hourly till temperature is normal for five days.

If oral medication is not possible sodium sulphathiazole or diazine injection as in primary pneumococcal infection detailed already should be pushed.

Preventive value of Sulphathiazole—in complications like pneumonia etc. in measles, influenza is not yet well-known, hence "specific recommendations are therefore not justified". But recent work appear to afford promising preventive result (see later).

Secondary Pneumonia—following measles, influenza etc. may be caused by virus (?) or strepto viridans, or hæmophylus

influenza or mixed infections where the results of sulpha drug therapy is variable or even disappointing.

IV. *Infection by Gas producing organisms like Welchei Cl. Septique, Cl. œdematiens.* It is needless to say that all surgical care for the removal of debris, crushed tissues and cleansing, thus making those parts free from sepsis as much as possible is essential prerequisite for these radical treatments.

SERUM :

(a) *Preventive* :—Polyvalent tetanus and gas-gangrene antitoxin 5,500 units need be given at the inception of the injury. (b) *Therapeutic* :—20,000 to 40,000 units given intravenously properly diluted and supplemented by intra-muscular serum injection. These may have to be repeated in 12 to 24 hours depending upon the symptoms, response on the part of the patient to the initial dose and so on.

Chemotherapy :—(a) *Prophylactic, sulphanilamide the* drug of choice, initial oral dose is 6 grams, subsequently one gram every four hours day and night, for seven days, which period almost always excludes the possibility of gas bacillary infection.

(b) *Therapeutic* :—6 grams of sulphanilamide initially, followed by one gram 4 hourly until temperature is normal for 48 hours, later 1 gram 4 times daily till reasonably cured.

LOCALLY :—

Crystals of sulphanilamide in 0.1 grm. doses to be applied per sq. inch of treated surface. This is used generally as a dusting powder.

V, STAPHYLOCOCCAL INFECTION :

(a) (i) *Localised boils and carbuncles.*—small furuncles require hot fomentation and surgical evacuation or indigenous drugs like 'Tokmari or Tokma'' applied after soaking in water as a poultice helps in the bursting out of the boil. No chemotherapy is generally required in these minor infections.

(ii) *Large Boils and carbuncles* :—
administer sulphathiazole an initial dose of 4 grm, subsequently one grm. 4 hourly for seven days. Encourage surgery, apply heat, evacuate necrotic sloughs. Avoid incision of uninfected tissue or of diffuse cellulitis.

(b) *Diffuse Cellulitis, Lymphangitis and Acute Osteomyelitis*—

(1) Immobilise the part with splint and elevate it. (2) Apply bulky gauze dressing, soak in salt solution, apply

heat where possible. (3) Give *Sulphathiazole* 4 grm. initially, followed by 1.5 grm. 4 hourly. Continue treatment so long as evidence of spread continues, then reduce dose to 1 gram 4 hourly. Continue treatment at least for seven days. (4) Employ all other required surgical methods (c) *Staphylococcal Septicæmia*—Suphathiazole 4 grm. initially followed by 1.5 grm. 4 hourly until the temperature is normal for 48 hours, subsequently 1 grm. 4 hourly to be continued for 14 days. *Adequate penicillin therapy appears best in combination with injection of sodium sulphathiazole in proper doses.*

Make every effort through careful clinical and roentgenological examination to ascertain and identify foci of distribution and localisation, treat them surgically where accessible. *If not drained the areas of infection may cause another re-invasion and the whole course of disease is thus repeated.*

(d) *Chronic Staphylococcal suppuration*—such as chronic osteomyelitis etc. (1) maintain drainage, by packing with petroleum gauze, unless necrosed bone separates and the wound granulates, (2) oral use of Sulphathiazole may not be so useful but local application of powder may be better.

The above completes the recommendation of the American *experts* except *toxic symptoms* etc. which will be dealt with later on.

VI. GONOCOCCAL INFECTIONS :—

(1) Lately, encouraging reports have been coming of *prophylactic use* of Sulphapyridine or Sulphamerazine or Sulphathiazole in doses of 1½ to 2 grms. initially, then 1 grm. 6 hourly for 3 to 5 days after exposure, (as a prophylactic).

(2) *Curative treatment*—

By sulphapyridine or Sulphathiazole better Sulphamerazine or Diazine should be in the same lines as in Pneumococcal or Meningococcal infections,[5] i.e. two to three grams initially, then I grm. every 4 to 6 hours for 3 to 4 days; subsequently according to the symptoms, to be continued for one week or more in doses of one and a half grm. four to six times a day.

In chronic cases of gonorrhœa with arthritis, epididymitis etc, in men, *salpingitis etc. in women* prolonged treatment for 2 weeks or more in adequate doses with a rest period of a few days in between and the course again repeated has produced good results in many and excellent result in some. In very chronic Gonorrhœa with discharge or gleet combined Sulphathiazole

5. Sroff (1946) Feb. Jour. Ind. Med. Ass. XV. No. 6 p. 151.

and Sulphanalimide or Sulphapyridine or Sulphamerazine or Diazine (combined) may do greater good than one drug alone because of the secondary strepto infection along with gonococcal infection. Cases refractory of sulpha drugs should be treated by *Penicillin*. But an average case of acute gonorrhœa is cured in 2-3 *weeks treatment with adequate doses* of sulpha drugs which formerly would resist months if not years of irrigation, vaccine and other therapy.

Ophthalmia neonatorum—

Due to gono-infection the eye of the new born is treated with 0.1 to 0.3 grms. i.e. quarter of a half a gram tablet every 3 hours during the first 24 hours, then less frequently 4-6 hourly for the next 3-4 days, also local application of suitable sulpha-ointment or penicillin solution may cure[5].

VII. *Urinary Infection by Bacilli of the Coli group* is also very ably treated by sulpha-drugs as during the process of excretion sufficient concentration is reached to cause bacteriostasis of the urinary infection. *The urine should be made first alkaline to litmus by a suitable alkaline mixture containing ½ a dram each of Potassium citrate and sodium acetate 3 or 4 times a day followed by sulphanilamide 2 to 3 grms initially,* then 1 grm. 4 to 6 hourly after having seen that the urine has been already alkaline. Three days to a week's treatment repeated after a period of rest usually cures. Water, fruit juice, milk should be pushed orally as much as possible.

VIII. *Bacillary Dysentery*—

All forms of Bacillary Dysentery are very successfully treated by adequate doses of *Sulphaguanidine*. Shiga, Flexner, Sonne and other infections by the sub-groups are almost as effectively treated by sulphaguanidine better by phthalyl-sulphathiazole.

Doses—

Initially 3 to 4 grms., subsequently 2-3 grms. every four to six hours till much improved in 3-4 days when the doses may be reduced to 1 to 2 grms 6 hourly till there is complete recovery in a week or thereabout. Castor oil mixture may or may not be given along with sulphaguanidine therapy. This drug is very slowly absorbed from the intestine, hence big doses are tolerated easily. Children should receive 2 to 3 grms initially, then 1 grm. 6 hourly till cured.

IX. *Cholera*: (See Cholera) Sulphaguanidine initially 3 grms. followed by 1 grm. 2 hourly till six such doses are taken, subsequently 1 grm. 4 hourly for one to two days more till the patient improves—caused only one fatality in a series of 22 patients. Lahiri got also encouraging results in Cholera by

Sulphaguanidine therapy. The difficulty is for patients to retain the drug due to constant vomits.

X. *Plague*[6] :—Treatment of Plague by Sulphathiazole in same doses as in staphylococcal septicaemia with plague anti-serum appears promising. Starting of treatment within 24 hours of onset gives best result.

XI. *Small-pox* : Treated with Sulphanilamide and sulphathiazole from the very onset specially during the period of suppuration i.e. an intensive treatment wih adequate dosage, for a week or longer as in carbuncle and cellulitis has been found useful in practice.

XII. *Intestinal Coli etc.* : Sulphasuccidine or Sulphasuxidine, Succinyl Sulphathiazole has been found useful in reducing the flora of bacilli coli in the intestines. It is specially useful in pre or post operative conditions of the intestinal tract; may also be used along with Sulphaguanidine or Sulphanilamide in urinary coli infection and other infections of the alimentary canal.

XIII. *In chronic Dysentery—specially Bacillary*, combined treatment of Sulphaguanidine and Sulphasuxidine has been found useful. In chronic intractable amoebiasis coupled with chronic bacillary infection this line of treatment is useful in some cases, followed by a subsequent antiamoebic therapy.

XIV. *Rheumatic Fever: Prophylatic use of Sulphanilamide*[7]—Several American workers, specially one group gave about 10 grain doses, (one and half tablets of 7 grs. each) 12 hourly morning and night during fall, winter and spring months (October to July) and in their 79 cases, so treated for months—and that for 2-3 years at a stretch, there was no major rheumatic episodes like pain, polyarthritis, carditis etc. while in the control series of 150 cases without any such treatment the major episodes were found in ten per cent. They remark "though hopeful the results require further confirmation in a large series of cases for prolonged period."

Mass Sulphadiazine Prophylaxis of Respiratory diseases in United States Navy[8].

Prophylactic action of Sulphadiazine was shown by:

(1) Reduction of morbidity rates for respiratory diseases,

(2) Hospital admission from respiratory diseases was much diminished.

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6. Wayson and Memohon 1944 March 24th. Public Health Reports—p. 385.
7. Coburn and Moore (1940 May) M. Clin North America—24 p. 633.
8. Bulletin New York. Acad. Med. June 1945—p. 281.

(3) Meningococcal infections eliminated.

(4) Pneumococcal Pneumonia significantly lowered in incidence.

(5) Virus infections are unaffected.

XV. *Sulfathalidine in Ulcerative Colitis etc.*

Recently[9] phthalylsulphathiazole or Sulfathalidine (Sharp and Dohme) Thalistatin (Herts Pharm) in daily doses of total three grms divided in one tablet or 0.5 grm. every four hours—with an initial dose of one to two grms. caused much improvement in intestinal diseases. Ross and Path[10] have reported that phthalylsulfathiazole absorbed sparingly from the gastro-intestinal tract is rapidly excreted in the urine, they claim that the new drug has two to four times the bacteriostatic activity of Succinyl Sulphathiazole[11] and that it causes no toxic symptoms in man[9].

Out of the hundred patients treated, 72 were female and 28 male, of these 80 had chronic ulcerative colitis, 6 amoebic dysentery, 2 bacillary dysentery, 8 giardia lamblia, 2 paratyphoid, 2 dientamoeba fragilis. In ulcerative colitis both the acute and the chronic cases improve equally effectively. The results in Giardia lamblia and in dientamoeba while favourable a larger number of patients have to be tried upon before a definite result could be shown. Clinically out of 100 patients 84 demonstrated good and 6 fair and 10 poor result to treatment. "In chronic ulcerative colitis cramping in the abdomen subsides within seventy two hours, the evacuations are reduced in number, the stools show a tendency to become formed and odorless and the blood in the stool disappears in a few days after intake of the new drug. The patient feels better, eats better and gains weight. The acute fulminating types respond well in that the temperature is reduced considerably in seventy two hours, the evacuations become less frequent and the tenesmus subsides." Some patients took it for weeks, others were on the drug for months proving lack of toxicity.

As regards dosage, three gram daily appears effective as larger doses, the smaller dose has the advantage of causing neither crampy feel of the abdomen nor diarrhœa evoked by larger dosage.

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9. Streicher (1945 Dec. 15) Jour. Amer. Med. Ass. 129, p. 1080.
10. Path and Ross (1943) Federation Proc. 2 p. 89.
11. Streicher (1943) M. Clin. North America 27 p. 189

The three gram dosage has got to be taken for a few more days than the larger dosage, and can be continued for months if desired.

This new remedy reduced the number and character of the inestinal contents, specially bacterial flora, most effectively and often remarkably. The number of bacteria per unit of stool cultured were most effectively reduced numerically getting less numerous as the remedy was continued.

XVI. *'Local applications'*—to most infections of the wounds, eyes, sores, ulcers, cellulitis, carbuncle etc. has been found useful; ointments, powder, etc. are the various forms in which sulpha drugs have been successfully used locally. The usual dose is 0.1 grm. or less per square inch of surface treated. Recently a rather gloomy report of local use is published by a special Medical Research Committee.[12]

Precaution to be taken in all cases of treatment by Sulpha-drugs: As there may be some trouble, even hæmaturia or anuria due to crystalline deposits of sulpha drugs during excretion through kidneys,[13] these patients should always get plenty of water and half of it sugared should be forced and thus adequate urine ensured. Milk and alkalies and sugar and fruit juice should be given liberally. But as an average patient in India can seldom afford to take adequate fruits and milk, a prescription like the following may be used and I use it as a routine 15 to 20 minutes before each dose of sulpha drugs, Potassium Critrate—Gr. 30, Sodium Acetate Gr. 15, Calcium Lactate (soluble)—Gr. 10, Syrup—Dr. 1, Aqua to make up to 1 oz. Plenty of sugared water with lime juice also need be given. Alkadies besides others prevent acidosis common in sulpha drug therapy. To alkalinise the urine about hundred to two hundred grains of alkalies may be required.

Contraindications: are eggs and sulphates which cause sulphaemoglobinaemia and poisoning, hence should always be with-held during active treatment and as most of these drugs are excreted in 12 to 24 hours, they may be exhibited to the patient after that period.

Toxic manifestations of Sulpha drugs—Though there may be noted minor differences due to the use of different compounds of the Sulphonamides, there is a general similarity in the toxic manifestations produced by them. Rarely may be seen a sensitive person manifesting symptoms of discomfort earlier in the

12. Meleney (1945) Surg. Gynaec. and Obste. 80 P-253
13. Murphy, Kuzma, Polley and Grill (1944) Arch. Int. Med. June P—433-443

course of treatment than others but usually enforcement of more water, alkalies, sugar, milk etc. may improve the situation. The efficiency of these remedies is so great and sometimes life-saving that one should not give up their use without very definite toxic manifestations of an endangering type. To switch on to a different but similar compound may solve the problem easily also. But when preceded by alkalies, sugar, milk and plenty of water toxic manifestations except very minor ones are rare in actual practice.

Toxic manifestations may affect the (1) Nervous System showing mental disturbances, sense of weakness, headache, giddiness, rarely neuritis including that of the optic nerve, (2) Urinary System—albuminuria, occasionally haematuria (specially in children), anuria, and renal calculi, pain in the kidneys and loin etc. (3) Hæmopoetic System— cyanosis due probably to methaemoglobinaemia, sulphaemoglobinaemia, acute haemolytic anaemia, thrombocytopenia etc. (4) Alimentary System, nausea, vomiting, diarrhoea, hepatitis, (5) Metabolic, acidosis, and loss of alkali reserve, (5) Drug Fever—"If fever occurs after the patient's temperature has been normal in the course of treatment with sulphanilamide or any of its derivatives, the drug should be discontinued, should not be resumed unless it has been demonstrated that the fever is due to recurrence of the infection."

Whenever the therapy with sulphanilamide is stopped because of the drug reaction, fluids should be forced so that 5000 c.c. or more are taken to wash out the drug from the system.

To a patient, showing marked toxic manifestations, it is safe to administer 0.1 to 0.3 grm. or 1/4 to 1/2 a tablet of 0.5 grm. every 4 hours for 3 to 4 doses to ascertain the severity. If severe, one should have to take recourse to penicillin or other suitable remedies for treatment of such sulpha-sensitive persons. The cayanosis is said to be prevented by oral use of methylene-blue in 2 gr. doses thrice daily and in more serious cases by injection of the same. Vitamin B complex should be given adequately during treatment with sulpha drugs. Of special use is nicotinic acid,

In a long series of cases in America dizziness was common; psychosis was found in 0.6 per cent. in sulphanilamide, 0.3 per cent in pyridine, rare in thiazole; *acidosis* in 1.9 per cent in sulphanilamide, 4 per cent. in pyridine and even 10 per cent. in thiazole; *loss of alkali reserve* is probably the most common metabolic toxicity which should be counteracted by an alkaline mixture given in the prescription used as a routine, pre-

ceding all cases of sulpha drug therapy. Wherever possible blood count specially from the point of view of agranulocytosis and haemolytic anaemia should be done frequently, notably where these drugs are used continuously for more than a fortnight. Generally blood changes of an endangering type is seldom noted in carefully observed cases except after a fortnight's continuous treatment by sulphadrugs and fortunately such prolonged treatment is seldom required except in grave cases of septicaemia etc. where regular leukocyte count should control and guide prolonged treatment.

Experience in actual practice shows that besides mild symptoms of toxicity like vomiting, cyanosis, some dizziness—this again rarely, there is hardly any very serious poisoning symptom requiring withdrawal of these very useful, often life saving, remedies. The death rate from pneumonia, meningitis, septicaemia has been brought down most encouragingly, hence their use should be insisted upon and that in adequate dosage till the patient is reasonably out of danger.

Choice of the preparation :—

Amongst the preparations Dagenan or M & B 693 appears to be poorly tolerated better are sulphathiazole, sulphadiazine, sulphamerazine—the last named one due to easy rise of blood concentration after oral use requires comparatively smaller doses. Sulphamezathine may be used in mild kidney damage.

CHAPTER VI

II. ANTIBIOTICS PENICILLIN ETC.

Discovery etc. of Penicillin :

Though bacteriologists of olden days[1] noticed that growth of certain contaminating fungi not only inhibited but actually killed living bacteria already grown in culture media, they took no serious note of this important fact, till Fleming[2] noticed the remarkable lethal effect on bacteria specially on cocci of an extract from broth culture of a fungus called Penicillium Notatum. This antibiotic extract he called "*Penicillin*" and to him the extraction of any potent therapeutically effective penicillin appeared unsuccessful due to its extremely liable nature.

1. Pasteur and Joubert (1877) Compt rend Acad. d. Sc. p-101
2. Fleming (June 1929), Brit. Jour. Exper. pth p-226

To a group of indefatiguable Oxford workers on lysozymes headed by Howard Florey goes the credit of isolation of therapeutically effective penicillin[3] and[4], which again was possible to be manufactured on a commercial scale for world wide distribution through the help of the American industrialists on drug manufacture. Recently several other fungi are also being investigated with varying results.

Striking Therapeutic Efficacy etc.:

Although Penicillin resembles the becteriostatic sulphonamides, Florey and his associates state: "The bacteriostatic power of penicillin against streptococci and staphylococci is much greater than that of the sulphonamides, even when these substances are tested under optimal conditions (small inoculum, peptone free media etc.[5])" The action of Penicillin unlike sulfonamides is neither affected by the number of bacteria nor in the presence of pus, peptones, tissue autolysates and other sulphonamide inhibiting substances. Pure penicillin is non-toxic to man and quite effective against organisms which have become sulphonamide resistant. Amongst the penicillin sensitive group of organisms very few appear resistant to penicillin. No drug administered systemically is known so far to interfere with the action, nor any drug is contraindicated in penicillin therapy. As a matter of fact there appears a synergic action between sulphathiazole and penicillin[6]. "The simultaneous administration of sulphathiazole and penicillin (if they behaved in the same way in vivo as in vitro) not only would control the infecting bacteria as well as a double dose of penicillin without sulphathiazole, but would also prevent to a considerable extent any multiplication of bacteria at those periods when the penicillin concentration in the blood is low[7]." The sensitivity and sensitization of the patients are less common with penicillin than with sulphonamide. Recently Sir A. Fleming stated that penicillin is effective against Sulphonamide fast cases. "Many laboratory experiments had been made in which an organism has been exposed to mixtures of penicillin and sulphathiazole or other of the sulphonamides, each ingredient

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3. Florey (August 1930) Ibid. p-251.
4. Lancet (1940 August 24th) p-22.
5. Abraham and Florey (1941) Lancet 2 p-177.
6. Brigger (1944 July 29th) Lancet 2. p-142-145.
7. Year Book of General Medicine (1945) p-93. Fleming (June 15, 1945) Brit. Med. Journal p-924.

being insufficient by itself, but the combination of the two had destroyed the organism." Hence in very severe infections a combined treatment appears better than either alone.

Stability, Reaction, Temperature etc.

Garrod[8]—(1945) showed that the lethal action of penicillin to bacteria ranges between 4° to 42°C and acidity from pH 7 to 5 the latter range of pH i.e. even slight acidity tending to deteriorate its action. In the dry pure state the sodium or calcium salt of penicillin is stable, though sodium salt is mostly used medically and calcium salt for surgical conditions. When stored at 4° to 10°C they retain potency from three to six months. At room temperature of America it is said to lose onethird to half its potency, hence the loss of strength is likely to be greater under tropical conditions. Once dissolved it should preferably be used up in twenty-four hours even when stored in an icechest or thermoflask or refrigerator, though in a refrigerator or icechest it may remain potent longer; this is one of the greatest difficulties in the universal usage of penicillin, specially in tropical rural practice. But recent encouraging reports on the thermostable oral tablets and peanut oil and beeswax mixture of comparatively thermostable injectable penicillin may do away with the difficulty of storing at such a low temperature. Orally very big doses are required to be therapeutically potent, the details of which are given later on.

Under Indian Rural conditions :—I have tried the following way of storage of penicillin and found quite workable. One cigarette tin or glaxo one pound tin container is filled with bits of ice and sawdust, the phials of penicillin powder are put inside this packing, this tin is put in its turn into a bigger tin or small bucket containing a packing of sawdust and bigger bits of ice, covering the inner tin container all round. The bucket is then covered up by a blanket or gunny bag or a suitable turkish towel thus preventing the inflow of heat. Cold is maintained for sometime by this or some such similar device in the absence of a thermoflask or suitable icechest.

Though ice cold temperature for storage of penicillin is ideal, yet cool temperature produced by mixing up cold tap or well or pond water and common salt in large proportions may produce a temperature in which penicillin even when in solution may be stored for a day or so away from sun or bright light without much loss of potency. But allowance must be made for any possible loss of potency by giving a comparatively

8. Brit Med. Jour. (1945 Jna. 27) p-107-110.

larger dose of units than otherwise. Chemicals, oxidising agents, antiseptics, sun, heat etc. all inactivate penicillin.

Absorption and Administration:

Rate appears to be influenced by "(1) Adequacy of circulation to the affected tissues." (2) "Route of administration" 1. *Intramuscular* is for all practical purposes the best, (a) because a higher concentration is maintained for a longer period of time, fifteen minutes after injection though the initial blood level is not so high as in intravenous use; (b) technic is simpler and may be carried out by a nurse or qualified attendant; (c) better tolerated. They are best given in the upper and outer quadrant of gluteus preferably also in the outer side of the thigh muscles of both the legs—alternately to prevent excess of pain. "The interval is three hours, as most of the penicillin is excreted by that time. Intramuscularly, penicillin is also given by continuous drip method in serious cases where sustained action is required for a prolonged period as in generalised sepsis, endocarditis etc. Local pain and risk of sepsis are the difficulties in this method."

Intravenously Penicillin[9]:

Is given best by continuous drip method specially in persistent infections like staphylococcal septicaemia, endocarditis etc[10]. Though by this means an initial high blood concentration of penicillin is reached, yet the excretion mainly through the kidneys is also quick, hence an uniform dosage has to be maintained regularly and that for days in bacteraemias etc.

Intermittent intravenous injections every half to one hour may have to be started with to be followed up by intermittent intramuscular injections in moderately severe cases of most infections specially in those caused by the more resistant organisms or where the initial symptoms are grave. This is done to prevent the development of penicillin resistant organisms by either too small initial dosage or injections at longer intervals. The daily total dose given by continuous intravenous drip may vary *from one lakh units to five lakh units daily*. Here penicillin is mixed with normal saline, and the dosage may be 2500 units to ten even twenty thousand units or more per hour. Recently there is a tendency to give very large initial doses to be followed up by comparatively larger doses intramuscularly.

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9. Herrell (1943) Proc. Staff Meet Mayo Clinic. 18. p. 65.
10. Flippin, Mayock, Murphy and Walferth (1945 Nov. 24th) Jour. Ame. Med. Ass. p 841.

Does not reach the Serous Membranes:

Unlike sulphonamides, injected penicillin does not reach in sufficiently active concentration in spinal theca[11], joint or pleural cavity, hence the requirement ot injecting penicillin locally to their respective places in addition to the systemic treatment given intramuscularly or intravenously. When given intrapleurally or in spinal canal 40 to 50 thousand units intrapleurally and 10 to 20 thousand units in the spinal canal respectively in 5 to 20 c.c. of saline or redistilled water after drainage of the pus in either cavity; therapeutically effective concentration being maintained for about twenty-four hours, one daily such instillation is adequate.

How to dissolve etc:

Sodium salt of penicillin is a yellow crystalline deliquescent powder sold in rubber capped phials of one or two lakh or five or ten lakh or thousand units (100,000 to 200,000, 500,000, 1000,000) Oxford units each, to be dissolved in sterile cool pyrogen free redistilled water or normal saline both freshly prepared preferably from ampoules. When dissolved in 20 c.c. the strength is five thousand units per c.c. in one lakh units, and so on. The solution should always be stored in ice chest or thermoflask or refrigerator and kept at about 4°C the full potency of the solution is thus maintained for 24 to 48 hours or longer, but it is safe to use the solution within twentyfour hours, specially once in solution notably for the treatment of grave diseases, where loss of strength is the supreme consideration. Sterile saline or glucose solution in redistilled water may be used but sterile redistilled water in cooled ampoules is the best solvent.

Dosage· Distribution, concentration in blood and excretion:

Though a lower blood concentration even for a shorter period may be effective against the more susceptible organisms like gonococci, pneumococci and certain groups of streptococci where *three hourly intramuscular injections of 20 to 25 thousand units* for one day to five days are enough ; for the more resistant staphylococcus aureus, alpha and gamma streptococci and strepto viridans a dosage of *forty thousand units or more every three hours for one to three weeks is suggested.* Fleming[12]

11. Nelson and Duncan (1944) Bull. John Hokpins Hosp. 75. p. 327.
12. Fleming (1944) Nov. 11. Lancet 620-621; Fleming. Young Et al (1944 Nov. 11) Ibid-2 p-621-624.

and others have demonstrated that given intramuscularly or subcutaneously (the latter route being discredited formerly[13] but now again accepted as useful) fifteen to twenty thousand units cause a blood penicillin level adequate for bacteriostasis, lasting for nearly three hours, hence the requirement of three hourly injections. In children comparatively smaller doses are required mostly according to body-weight . The question of the bacteria involved and several other factors are concerned in the cure of the patient. It is a strange fact also that people vary in their blood penicillin concentration—the same dose showing different concentrations in different people even in the same patient under different circumstances. This question is rather elusive and depends more on the internal environment of the patient than other factors.

It is commonly believed that by doubling the dose injected, the blood concentration of penicillin will be doubled if not also the duration of retention in the blood,—the fact appears that unless four times the dose is given the blood concentration is not likely to be doubled. Hence where higher concentrations are required for prolonged periods intravenous drip is the method of choice specially in bacterial endocarditis, staphylococcal bacteraemia[14] etc. Rantz and Kirby (1944)[15] have demonstrated that predictable plasma concentration of penicillin will be obtained when given by intravenous continuous drip method under rigidly controlled conditions. Most of the penicillin injected is excreted by the kidenys (about 58 per cent) during the first hour, hence when kidneys are damaged the stay of penicillin is not only longer but the blood concentration of penicillin has been found effective in cases of susceptible organisms.

Prolonging action of penicillin :

The fleeting effect of penicillin necessitates continuous or three hourly injections, a difficult proposition in out of the way places. In order to do away with all these difficulties numerous efforts are being made to prolong the action of this remedy.

By an admixture of *penicillin in pea-nut oil and beeswax not only the action has been prolonged but also the thermolabile character is modified, this product standing higher temperature better and that without appreciable loss of potency.* These injections are somewhat painful and required to be well

13. Cooke and Goldring (1945) Jour. Amer. Med. Ass. 127.p-80
14. Rammel Kamp and Kirby (1945) Bull. New York. Acad. Med. 21 p. 656.
15. Rantz and Kidby (1944).

massaged and fomented, action lasts about 8 hours in the minimum, hence 8 hourly injections are required. Orally similar preparations are being used also.

Simultaneous administration of *para-aminohippuricacid* not only raises the relative concentration of penicillin in blood but also causes its longer retention in the blood by delayed clearance of penicillin through the kidneys. How far these will be applicable for therapeutic purposes it is not easy to forecast, but has undoubted possibilities.

Recently the stay of penicillin in blood has been prolonged by subcutaneous injection in areas already rendered cool by "local application of ice one hour preceding and 2 hours following injections at the site."[16]

Distribution of Penicillin :

As already said penicillin does not reach in adequate concentration in pleural, spinal and joint cavities, hence the requirement of separate administration in their respective cavities by local instillation besides systemic injection therapy. Penicillin cannot pass the barrier of necrotic tissues or walled off abscesses and is inactivated by gastric and pancreatic juice. But recently huge doses of penicillin in capsules given orally before meals, the gastric acidity having been neutralised previously are affording good therapeutic results. Given intravenously in twenty thousand unit doses bile contains significant amount of penicillin about 20 to 30 minutes after the injections. According to Harrel of Mayo Clinic following systemic administration "the amount of penicillin present in the joint fluid usually will be approximately half that found in the blood" but with intra-articular administration penicillin remains in that structure for "atleast 24 hours."

Local Use :

Penicillin has been used very effectively for the treatment of all sorts of sores, ulcers and also in throat and eye including numerous other local conditions within the reach of topical therapy. The generally advocated strength is 500 to 250 units per c.c., the lower dilution being preferred by many, because the lower strength appears as effective if not more so than the higher ones. Calcium penicillin appears better suited for local use, and other local surgical conditions than sodium penicillin.

16. Tremper and Hutter (1944) Science 100 p.-432.
17. Herrell (1945) Med. Clin. North America 29 p-909.
18. Year Book of Medicine (American) 1945 p. 87.

Aerosol Penicillin :

Fine spray of penicillin in the upper respiratory passages, and a specially devised machine spray in the atmosphere from which the patient *inhales called penicillin aerosol*[19] has cured many lung conditions. The details of this will be found under the treatment of pneumonia.

Oral penicillin :

Recently there is an increased tendency to use penicillin orally. But as the absorption from intestine varies in persons and when the infection is serious it is thought advisable to supplement oral therapy by parenteral injections.

Tablets of calcium or sodium penicillin buffered with tri-sodium citrate or other suitable antacids are given in empty stomach as said already. The stay of penicillin in blood is longer and one or two oral doses of two lakh units have cured gonorrhœa etc. Recently penicillin in oil and beeswax orally showed more lasting and sustained blood levels.

Penicillin is being *administered by mouth* in the form of capsules and lozenges, it can be applied as an ointment, and also as dental cones. The dosage varies from person to person depending on the type and severity of the infection, the object being to bring the infection under control as quickly as possible. The lozenges taken orally, should contain not less than 20,000 units, and the total number of units in the whole package should not be less than three lakh units. Trench mouth and other oral infections are beneficially treated by allowing penicillin tablets to get dissolved in mouth two to three times a day in between meals. Orally penicillin is to be given on a "fasting stomach" and not less than 30 minutes before or not less than one and a half to two hours after a meal. *Penicillin ointment* in collapsible tubes may be used for the eye, skin, ulcers etc. suspected to be caused by penicillin sensitive organisms. A dental cone should have a potency not lesser than 500 units. A cone can be inserted after tooth extraction or as treatment for dry socket. Oral tablets of penicillin are now available in the market.

A few practical details of use of penicillin

(1) The syringe should contain no antiseptic as traces of ether or alcohol will inactivate penicillin hence it should be

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19. Knott and Clark (1945) Lancet Apr-14. 1 p-468.
20. Bloomfield, Kirby and Armstrong (1944) Jour. Am. Med. Ass. 126. p. 685.

washed repeatedly with sterile saline or redistilled water before actually drawing in penicillin. Recently it appears that traces of pure alcohol are not very inactitivating.

(2) Wherever possible ether or pure alcohol should be the antiseptic used for the skin and the syringe because when evaporated completely no trace of the antiseptic is left in either places to inactivate any penicillin..

(3) Tincture iodine appears unsuitable as traces of iodine may inactivate penicillin.

(4) Injections are given best in the gluteus or in the outer side of the thigh each alternately, thus minimising the pain. Deltoids should not be used where the outer thigh muscules are available.

(5) Fine bore needle is useful.

(6) The solution for dilution of penicillin should either be fresh pyrogen free sterile normal saline or redistilled water, preferably from freshly opened ampules cooled in ice chamber.

(7) A 0.5 to 1.0 per cent. procaine hydrochloride solution may be injected with penicillin to render it painless, but only a limited amount of procaine can be given to a person—a fact to be remembered. All other aids, surgical etc. are to be taken.

(8) In thrombotic lesions heparin, dicoumarin, and in sepsis surgery, drainage, antitoxins, good nutrition, vitamins etc. should always be utilised.

In continuous intravenous drip :—

One should be careful (1) to change the apparatus once daily atleast to avoid contamination and sepsis. (2) Diluent should be changed and sufficient electrolytes such as salt etc. supplied to the patient. (3) As there is risk of venous thrombosis—elevation of the limb may reduce possibility of thrombosis.

General Principles of Penicillin Therapy :

(a) Infecting organisms must be sensitive during the whole course of penicillin therapy. (b) Penicillin must reach the infecting organism by local instillation into the pleural, joint or spinal cavities should have to be supplemented with the regular and systemic use of penicillin. Peritoneal, bursal or abscess of the throat, nose and eye cavities also should get local treatment besides systemic injections (ii) In very weak circulation where the absorption of locally injected penicillin is doubtful, its use may not be effective, hence intravenous is the chosen route. In fibrosis or foreign body retaining constant infection or in large walled off abscess penicillin may not prove very

effective. (c) Penicillin should be given in adequate dose and at regular intervals throughout the whole course of treatment. Otherwise too small initial dosage or longer interval may produce penicillin resistant strain of organisms. (d) Certain intestinal becteria produce penicillinase, an enzyme, which is responsible for the destruction of the bacteriostatic properties of penicillin—thus preventing the action of penicillin in some intestinal infections. (e) There must be certain serum-level of penicillin in order to cause bacteriostasis—hence the importance of adequate dosage and proper frequency of injections. (f) Wherever possible all help from surgery such as drainage, removal of sequestrum, septic foci, the simultaneous use of antitoxins etc. and all adjuvants such as food, meat and stimulants should be made use of to their fullest, because it is ultimately on the raised resistance of the patient that we depend for cure here also. (g) all possible nutritive support should be given—such as in fluids, diet, drinks, saline infusions, glucose, blood or serum or plasms transfusion etc.

Limitations and Failures of Penicillin[20]

(1) The present requirement of frequent injections, and limited stability of penicillin, but penicillin in beeswax and peanut oil already available in Indian market obviates the necessity of 3 hourly injections. Eight hourly injections are quite effective here but the price is high now for many in India but may be cheaper later on. Before actual injection the oily suspension has got to be warmed at body temperature and while injecting 1 c.c. due to loss in syringe etc. 1.2 to1.3 c.c. are to be taken. The pain at the site of injection may last 1 to 2 days or longer. The oral tablets of penicillin (Squibb & others) appear expensive again because the dosages have got to be rather high[21]. Sometimes for oral use 3 to 6 times the dose required for injection [23], have got to be given in between meals already suggested.

(2) Organisms normally penicillin sensitive rarely may develop into penicillin resistant strains, by too low or infrequent initial dosing.

(3) Certain bacteria by producing penicillinase may destroy penicillin, the list includes Bacillus-Cereus, B. Megatherium, B. Anthracis, Escherichia Coli, Aerobacter, aero-

21. Findland, Meads and Ory (1945 Sept 29th)\ J. A. M. Ass. 129 p. 315
22. Bun, Mc. Dermott, Hadley and Carter (1945) 29 Sept. Ibid, p. 320
23. Ross, Mcledon (1945) Ibid. p. 327

genes, paracolon bacillus, Shigella Dysenterica, S. paradysenteriae, S. Sonnei, S. Newcastle, Alcaligenes faecalis, some strains of pseudomonas[24]. This factor appear not to have been fully worked out yet.

(4) In very overwhelming infections where the patient may die before penicillin had time to act or even inspite of adequate penicillin therapy.

(5) Failure due to inadequate dosage and in oral use due to failure of absorption from the gut in some cases.

(6) Failure due to inadequate surgical drainage or lack of antitoxin in tetanus, gasgangrene etc. in addition to adequate penicillin therapy.

(7) Though penicillin is said to be of not much use in nephritis recently Sen[25] has treated twelve young patients of acute nephritis with recovery in eleven (a very high rate of recovery indeed) one dying in two days *i.e.* before penicillin took effect. He gave usually ten thousand units three hourly for two to eight days according to indication. But in such a condition as nephritis with a tendency to recur it appears more judicious to follow up these cases for some years before one can assess the permanency of these results.

TABLE 1

Antibacterial Action of Penicillin in Vitro and in Vivo

Susceptible organisms	*Insusceptible organisms*
Diplococcus pneumoniae	Eberthella typhosa
Streptococcus pyogenes	Salmonella paratyphi
Streptococcus Salivarius	Salmonella enteritidis
Micro-aerophilic streptococci	Shigella dysenteriae
Staphylococcus aureus	Proteus vulgaris
Staphylococcus albus (some strains)	Pseudomoans aeruginosa (Bacillus pyocyaneus)
Neisseria gonorrhoeae	Pseudomonas fluorescens
Neisseria intracellularis	Serratia marcescens (Bacillus prodigiosus)
Actinomyces bovis	Klebsiella pneumoniae
Bacillus anthracis	Haemophilus influenzae
Bacillus subtilis	Haemophilus pertussis
Clostridium botulinum	Escherichia coli
Clostridium tetani	Staphylococcus albus (some strains)
Clostridium perfringens (welchii)	
Clostridium septicum	

24. Bondi, Amedo and Dietz (1944) Proc. Soc. Exper. Biol. and Med. 56 p. 132
25. Sen (1946 March.) Am. Jour. Med. Sc

TABLE 1 (*Continued*)

Penicillin indicated	*Penicillin of doubtful or no value*
Corynebacterium diphtheriae	Monilia albicans
Micrococci (some strains)	Monila candida
Streptobacillus moniliformis	Monilia krusei
Erysipelothrix rhusiopathiae	Blastomyces
Borrelia novyi (spirochete of relapsing fever)	Mycobacterium tuberculosis
Treponema pallidum	Streptococcus faecalis
Leptospira icterohaemorrhagiae	Brucella melitensis
Spirillum minus	Plasmodium vivax
Psittacosis virus	Trypanosoma equiperdum
Ornithosis virus	Toxoplasma
	Virus of influenza

TABLE 2

Uses and Limitations of Penicillin Therapy

Penicillin indicated	*Penicillin of doubtful or no value*
Infection of blood stream and heart	
Bacteriemia due to	Bacteriemia due to
Staphylococcus aureus	Colon-typhoid-dysentery group
Staphylococcus albus	Proteus
Streptococcus pyogenes	Pseudomoans aeruginosa
Diplococcus pneumoniae	Klebsiella pneumoniae (Friedlander's bacillus)
Anaerobic streptococci	Tularemia
Nonhemolytic streptococci	Brucellosis
Neisseria intracellularis	Mononucleosis
Subacute bacterial endocarditis	Leukemia
Suppurative pericarditis	Malaria
	Rheumatis fever
Infection of Central nervous system, including the eye	
Meningitis due to	Infections due to
Neisseria intracellularis	Mycobacterium tuberculosis
Diplococcus pneumoniae	Torula
Staphylococcus aureus	Blastomyces dermatitidis
Streptococcus pyogenes	Coccidioides
Anaerobic streptococci	Sporotrichum

TABLE 2 (*Continued*)

Penicillin indicated	*Penicillin of doubtful or no value*
Infection of Central nervous system, including the eye.	
Green-producing streptococci (some strains)	Klebsiella pneumoniae
Brain wounds	Haemophilus influenzae
Brain abscesses	Poliomyelitic
Blepharitis	Encephalitis
Conjunctivitis	
Dacryocystitis	
Ophthalmitis	
Corneal ulcer	
Cellulitis	
Gonococcic ocular infections	
Syphilitic ocular infections	
Respiratory system	
Sinusitis	Tuberculosis
Otitis media	Blastomycosis
Labyrinthitis	Coccidiosis
Septic sore throat	Torulosis
Pharyngitis	Moniliasis
Tonsillitis	Friedlander's pneumonia
Throat carriers (group A streptococci)	Yeast or fungous infections
†Diphtheria	Primary atypical pneumonia
Pneumonia	Influenzal (virus) pneumonia
Ornithosis	
Psittacosis	
Bronchitis	
Bronchiectasis	
Empyema	
Lung abscess	
Suppuratice pulmonary disease (preoperative and postoperative)	
Mediastinitis	
Skeletal system	
Acute osteomyelitis	Rheumatoid arthritis (Acute or chronic)
Spreading osteomyelitis of carnial and facial bones	Rheumatic fever
Mastoiditis	Intermittent hydrops of joints

TABLE 2 *(Continued)*

Penicillin indicated	*Penicillin of doubtful or no value*
Chronic osteomyelitis (when combined with surgery)	Tuberculosis
Osteomyelitis associated with compound fractures	Spondylitis associated with Uudulant fever
Acute pyogenic arthritis	Typhoid fever
Skin and soft tissues	
Eczema	Chickenpox
Furunculosis	Herpes
Carbuncle	Acne
Impetigo	Pemphigus
Cellulitis	Lupus erythematosus
Ludwig's angina	Blastomycosis
Sinus thrombosis	Coccidioidomycosis
Postoperative parotitis	Sporotrichosis
Scarlet fever	Yeast infections
Infected wounds	Histoplasmosis
Infected ulcers	Epidemic parotitis (mumps)
Infected burns	Granuloma inguinale
Smallpox	Myositis
	Dermatomyositis
	Tularemia
Genitourinary system	
Perinephritic abscess	Interstitial cystitis
Carbuncle of kidney	Chancroidal infection
Pyelonephritis	Infections due to
Pyelitis	Colon-typhoid-dysentery group
Cystitis	Pseudomonas aeruginosa
Prostatitis	Proteus
Urethritis	Streptococcus faecalis
Periurethral abscess	
Epididymitis	
Balanitis	
Pelvic cellulitis	
Puerperal infection	

TABLE 2 (*Continued*)

Penicillin indicated	*Penicillin of doubtful or no value*
Special diseases	
Gonorrhea	
Proctitis	
Vulvovaginitis	
Ophthalmitis	
Arthritis	
Syphilis	
Early syphilis	Late syphilis
Late syphilis	Neurosyphilis
Gummatous	
Congenital	
Yaws	
Relapsing fever	
Weil's disease	
†Gas gangrene	
Actinomycosis	
Rat-bite fever	
Anthrax	
†Tetanus	
Vincent's infection	
Peritonitis	

†*Combination of penicillin and antitoxin indicated*
From Herrell, W.E. : Penicillin and Other Antibiotic Agents, Philadelphia, W.B. Saunders Co., 1945.

Bacteria Sensitive thus amenable to penicillin treatment in short are :—

I. *Staphylococcal infections of all sorts with or without bacterœmia* :[1]

(a) *Septicaemia*—best treated by contiouous intravenous drip method—initially to be started with higher doses of 40 to 50 thousand units every half hourly till a total dose of 250, to 500 thousand units daily for a week or longer until clinical improvement occurs followed by 200, 300 thousand or 2-3 lakh units daily till a total dose of 25 to 30 lakh units or more are given in all. When once the disease is controlled, intermittent three hourly intramuscular injection of 20 to 25 thousand units may follow

1. Keefer, Blake, Marshall etal (1943 Aug. 28) Jour. Am. Med. Ass. 122 p 1217.

the continuous intravenous drip for weeks may be 3 to 4 weeks or longer already given. As staphylococcal septicaemia was almost invariably fatal in presulphathiazole and penicillin days it is prudent to leave no stone unturned to save the patient, hence as already suggested due to their synergistic effect, simultaneous injection intramuscularly or intravenously of sodium sulphathiazole initially three to four gms. to an adult followed by injections of one to two gms. every six hourly along with penicillin is advocated, and we have successfully treated three such serious cases by this combined treatment. Recently Fleming has stressed on this synergistic action of sulphonamides and penicillin apparently concerning all bacteria.

(b) *Pneumonia or serious lung condition*—brought about by staphylococcus and *meningitis of Staphylococcal* origin require the above lines of therapy except that in empyema the pus should have preferably to be drained out and about 40 thousand units of penicillin introduced locally intra-pleurally. In case of meningitis by staphylococci, a serious disease,—after the pus is drained out through the lumber puncture needle 10-20 thousand units of penicillin has got to be pushed into the spinal theca. These local drainage of pus in both conditions and local instillation of penicillin have got to be repeated daily till the patient's condition is better clinically warranting discontinuation of therapy.

(d) *Cavernous or lateral sinus thrombosis*—usuallly caused by staphylococcus is associated with fever leukocytosis, swelling of the eyes etc. In the former condition, besides systemic injections of penicillin as in cases of septicæmia when severe, or in smaller dosage of 20 to 25 thousand units every 3 hourly may have to be coupled with sodium sulphathiazole intramuscularly. *Heparin* in 15 to 20 thousand unit doses intramuscularly on alternate days till 2 to 4 such injections are given may do good. Recently one case of cure by penicillin alone without heparin is reported.

(e) *Acute Osteomyelitis*[3] notably of the more vascular bones responds to injections of penicillin. The frequency dosage is as in septicæmia, but surgery, drainage etc. should never be neglected, and a combined treatment with sodium sulphathiazole injections appear better than either alone. In all cases of surgical nature the surgeon should always be consulted.

2. Dawson and Hobby (1944)—5th article Book on Penicillin by United States office of War Information.
3. Grace and Bryson (1946 March 30) Jour. Am. Med. Ass. 130 p—841.

Treatment may have to be continued for eight weeks or longer —to be effective, and must be started early.

(f) *Carbuncle* when serious specially when in combination with diabetes mellitus, simultaneous insulin and penicillin—in 20 thousand unit doses three hourly has done much good and is a definite improvement on our old treatment. Suitable local therapy and surgery should always be taken aid of.

(g) *Wound infections,* unless very serious requiring *regular systemic* injections may be amenable to local application of a solution of penicillin usually between 500 to 250 units per c.c. (See local use on p. 42.)

Most strains of *staphylococcus albus are* susceptible hence amenable to intramuscular or intravenous penicillin therapy.

II. Almost all strains of *streptococci,* specially betahaemolytic mesophilic, non-hæmolytic, some alpha haemolytic and viridans are susceptible hence curable by penicillin therapy. Generalised *streptococcæmia* or severe infections *like cellulitis, mastoiditis, with complications like meningitis, sinus thrombosis, empyema, peurperal sepsis, peritonitis,* etc., are best treated to start with by intravenous continuous drip or to initiate treatment first by half hourly intravenous three doses of 40 to 50 thousand units to be followed up subsequently by 20 to 40 thousand units intramuscularly every three hourly. In empyema and meningitis pus should have to be drained out daily with local instillation in their cavities 40 to 50 thousand units and 10-20 thousand units respectively. Local and surgical measures should never be neglected, and whenever in doubt the opinion of a surgeon taken. The length and duration of treatment should depend on the clinical results. The fever should go down—culture of material of the respective areas should be sterile etc., thus signifying a cure.

III. *Pneumococcal infections of the lungs, pleura, meninges, peritoneum* etc. are very successfully treated by penicillin injection as the organisims are very susceptible to the remedy.[4]

Though sulphadiazine, merazine and thiazole have been found useful in the treatment of pneumonia *penicillin is indicated* in "(1) high pneumococci count in the sputum with evident or impending œdema, or shock or toxic delirium, leukocyte count below 6000, or other signs of severe infection or toxicity, (2) failure to respond to adequate dosage of sulphadiazine and (3) pneumococcic type III pneumonia in patients over 40" or in patients with previous or present history of sensitivity to

4. Meads, Harris and Finland (1945 June 28) New. Eng. J. Med. 232 P747—755.

sulphadiazine before the pneumonic process has cleared, cardiac failure, renal insufficiency, severe dehydration or acidosis. Besides the above indications—penicillin is also indicated in cases where there is any retention of water or any cardiac, renal, complication with œdema; under penicillin therapy large amounts of water are not indicated as in sulphonamide therapy, and in systemic pneumococcæmia as shown by positive blood culture, auricular fibrillation, delirium tremens, severe anaemia, gross haematuria, oliguria, anuria, nitrogen retention, or even when drug rash appears before pulmonary infection has been controlled. Crystalluria or microscopic haematuria is not a contraindication to sulphonamide therapy but only indicates pushing on of more fluid and alkalies.

Aerosol penicillin[5] *via the lung*—The pain of repeated injection for a prolonged period specially in very young children, rapidity of excretion and inactivation in the presence of gastric acidity when given orally are therapeutic handicaps. Some of these difficulties have been circumvented by causing absorption of penicillin via the respiratory tract, particularly the lungs. Knott and Clark[6] used true aerosol penicillin or a mist of penicillin dispersed by an electrically driven generator and found that at room temperature (in England) a penicillin aerosol remained fully active for at least 90 minutes. Persons exposed to such penicillin laden atmosphere show therapeutically potent penicillin excretion in their urine after an exposure of 30 minutes. This may render simultaneous treatment of several patients in one room possible and that without the disadvantages of scores of painful pricks, specially in the babies. It might in future be used for the operation theatres and to clearout impure atmosphere etc. and is endowed with great possibilities. All supportive treatment, good diet, vitamins, serum or blood transfusion, adequacy of fluids, saline glucose injection, combating of anaemia, making inhale oxygen etc. should not be neglected.

Lately aerosol penicillin has been used in chronic bronchitis bronchiectasis, respiratory infection with congenital heart failure, pneumonia and generalised bronchitis and lung abscess with good results in the majority of cases. Conditions *successfully treated include acute and relapsing pneumonitis due to* various cocci, tonsillitis, sinusitis, sinubronchitis, pharyngitis with gastrointestinal manifestation and intrinsic bacterial asthama; several other manifestations of bacterial allergy, such as migraine, eczema, colitis, hypertension, extreme fatigue, psy-

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5. Joules (1946) Aug. 3. Brit. Med. Jour. p 171.
6. Knott and Clark (1945 April 14) Lancet 1 p 468.

choneurosis etc. associated with upper respiratory passage infections, were treated with encouraging results.[7]

The advantages are the ease and adaptibility in any suitable place at home or even in office through a mouth piece or oxygen mask, relative cheapness with local and systemic effectiveness. The greatest advantage is the avoidance of the prick of the needle and its consequent but inseparable pain tenderness etc. Exposure to aerosol penicillin morning and evening or thrice daily, i.e. eight hourly may be quite effective.

Atypical virus pneumonias appear to remain unaffected under either sulphonamides or penicillin except when complicated by secondary organisms, the latter being amenable mostly to both the drugs.

Dosage—Though it is better always to initiate treatment by three half hourly intravenous injections of 40 thousand units each of penicillin, pneumococci being very sensitive to penicillin 20 to 25 thousand units every three hourly intramuscularly and in very grave cases intravenously one to two lakh units daily for 5 to 7 days appear adequate. The pneumococci usually die earlier though. The total dosage varies usually from four to ten lakh units or more.

Failures may be due to (1) treatment being started on a moribund patient (2) inadequate doses of penicillin or sulphonamides, (3) presence of severe associated diseases. (4) penicillin resistant organisms being developed as a result of insufficient and unduly widely spaced injections of penicillin etc.

Empyema[8] require drainage of pus and local intrapleural instillation of 40 to 50 thousand units of penicillin once a day. Systemic treatment is also indicated provided there is active infection in the lungs or in the system in general. Pneumococcal peritonitis and meningitis are serious conditions and require vigorous systemic as well as local penicillin treatment in adequate dosage.

IV *Meningitis*—Though sulphadiazine in adequate doses is according to some workers the remedy of choice in meningococcal meningitis—certainly meningitis caused by strepto, pneumo[9], gonococci and specially by staphylococci should have

7. Vermilye (1945 Sept 22) Jour. Am. Med. Ass. 129 p 250. Medical uses of Penicillin—Fleming (1946 June 15) Brit. Med. Jour. p 924.
8. Healy and Katz (1945 June 23) Jour. Am. Med. Ass. 128 p 508 and series in the same issue.
9. Heilman, Heilman, Hinshaw et al (Nov 1945) Ibid. p. 576-584.

to be treated by liberal doses of penicillin. Systemically as in septicaemia in 20 to 40 thousand units every three hourly intramuscularly as well as by daily local instillation in the spinal theca in 10 to 20 thousand units doses, after drainage of the pus daily[10]. This amount of penicillin is dissolved in 10 to 20 c.c. of sterile normal saline and slowly injected into the spinal canal through the lumber puncture needle. This quantity injected may not exceed the quantity of pus or fluid drained out already. I have seen some crebral irriation a few hours following intrathecal penicillin therapy but ultimately they all recovered. Maningeal involvement during staphylococcal septicaemia should always be treated by combined injections of liberal doses of sodium sulphathiazole and penicillin, the latter intrathecally also. This may save some patients formerly lost by our conservation therapy of olden days. In very severe cases intravenous continuous drip of five to ten thousand units per hour for a few hours to be followed up later by intramusceluar injection. Too much concentrated solution of penicillin and more frequently than once daily intrathecally appears risky (see meningitis.)

Streptococcal infections of a grave nature specially septicæmia, abscess lung, and all other clinical conditions[11] caused by certain hæmolytic organisms are very sucessfully treated by penicillin in doses of about twenty thousand units every three hourly. In more serious conditions intravenous continuous drip method may have to be taken resort to, or bigger i.e. 40 to 50 thousand units given three hourly intramuscularly preceded by three or more half hourly intravenous injections of bigger doses of penicillin.

V. *Gonococcal infection*[12]—Even sulphonamide resistant gonococci are very susceptible to penicillin therapy. Though there is no unanimity about the total dosage and frequency of injections, it is now accepted that not less than two lakhs are adequate. Allen[13](1946) tried a single injection of 2 to 3 lakh units with good success. But it has the demerit of possibility of producing penicillin resistant gonococci and the

10. Rammelkamp, Keefer (1943 March) Am. Jour. Med. Sc 205 P-342.
11. Smyth, Billinglea (1945. Dec 8) Jour. Am. Med. Ass. 129 P-1005.
12. Batchelor, Donald, Marrell (1946 Aug. 3) Brit. Med. Jour. P-151.
13. Allen (1946) Ibid. 1 P314.

risk of masking an early syphilis. Harrison[14] (1945) recommended five two hourly intramuscular injections of thirty thousand units of penicillin. Recently Lees[15] (1945) has adduced a cure rate of ninety eight per cent in 344 sulphonamide resistant cases treated with ten three hourly doses of ten thousand units of penicillin. According to Marshall[16](1945) "the best method of treatment of gonorrhœa with penicillin is with doses of not less than one lakh units given intramuscularly in four or five seperate injections at 2 hourly or 3 hourly intervals over a period of 8-12 hours." Romansky and Rithman (1944) treated gonorrhœa cases with success by a single injection of one lakh units in beeswax and peanut oil suspension of penicillin containing magnesium sulphate to delay absorption, got 95.6% cure in a series of 113 males by one injection method. Recently Batchelor etal have given one and two intramuscular injections of two lakh units each respectively. In order to delay the absorption 2-3 minims of adrenalin chloride was drawn in the syringe containing 2 lahk units of penicillin, but some of those injected with adrenalised penicillin complained of giddiness, palpitation etc. Those who got two injections of 2 lakh units each got them at six to eight hours after the first one. By the last method 95.8% of males and 9).9 of females were cured in a series of gonorrhœa cases.

Gonococcal infections of *chronic types* with arthritis etc. may improve under penicillin therapy in near about 20 thousand units three hourly for 3 to 7 days. The structures affected take some time to get healed up hence recovery is not likely to be so dramatic as in cases of acute infection. Combined sulphonamide and penicillin therapy may be more useful than either alone. Reappearance of pus in a cured case usually means relapse or reinfection, but sometimes sterile pus may continue for a couple of days or so. Big doses of penicillin may mask the symptoms and delay the onset of syphilis if infected simultaneously.

Ophthalmia neonatorum :—may effectively be treated by instillation every few hourly into the eyes of a 250 to 500 units per c.c. solution of penicillin in redistilled water, because normal saline may cause some irritation to the eyes of the baby. Simultaneous intramuscular injections are better and safer than local use only.

Refractory cases to penicillin—A case of gonorrhœal vulvo vaginitis in a child of four years proved refractory even to

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14. Harrison (1945) Pratitioner, 155, P-223.
15. Lees (1946) Brit. Med. Jour. 1 P-605.
16. Marshall (1945) Brit. J. Vener. Dis 21 P-150.

ninety-nine three hourly intramuscular injections of a total dose of nearly thirtyone lakh units of penicillin. This should be an eye-opener to us, who thought penicillin as infallible in gonorrhœa.

VI. *Endocarditis—lenta or subacute bacterial endocarditis*[17] was treated with some success by combined treatment of 200 mg of heparin, at first daily for 2 to 3 doses then on alternate days subcutaneously or intravenously after being properly diluted, with penicillin given *for three weeks to a month or longer by continuous intravenous drip in 1 to 2 liters of 5 per cent dextrose solution till a total dose of two hundred thousand units per day is given.* Several cases treated in the above lines appear to have recovered. A preliminary sulphanilamide treatment seem to increase the efficacy of penicillin heparin therapy.

VII. *Acute bacterial or so called ulcerative endocarditis*[18],[19]—Recently six cases of acute bacterial endocarditis are reported, four due to hæmolytic streptococci three of group B and one of group A and two of staphylo-aureus origin. In four of them intermittent intramuscular three hourly injection of about twenty thousand units of penicillin were given, the other two received continuous intravenous drip for the initial stages to be followed up by intramuscular injections for three weeks to a mouth or longer depending on the clinical condition of the patient. One patient required double the above initial dose. Three of these six are well, where as the other three died in the long run thus showing a fifty per cent recovery rate in an invariably fatal disease before the advent of penicillin. *Large dosage, of five lakh units daily, for twenty eight days appeared to produce the best result so far got.*

VIII. *Acute Diphtheria*[20]—though demand treatment with adequate antitoxin as usual, yet combined penicillin therapy appears useful, specially the carriers are lesser. Parmanent or other carriers may be made free by local spray and systemic injections of penicillin.

IX. *Typhus and Similar infections by rickettsia bodies* in experimental mice was successfully treated by intravenous use of penicillin, the treatment having been started quite early in

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17. Flippin, Mayock, Murphy, Wolferth (1945 Nov 24) Jour. Am. Med. Ass 129 P-841.
18. Dawson, Hobby, (1944) March 4 Ibid 124 P-61
19. Dolphin and Cruickshank (1945 June 30) Brit. Med. Jour. P-897.
20. Dodds (1946 July 6) Brit. Med. Jour. P-8.

the disease. I know of one case of typhus fever in a young Indian officer successfully treated by large doses of penicillin given intravenously for one week. But lately para-aminobenzoic acid given orally in 4 to 8 g doses and continued in 29 two hourly till a total dose of 70 to 200 g has been given, and provided it has been started early in the disease appear to influence the infection and mortality rate favourably.

X. *Infection by clostridia*—In all cases of contaminated wound or injury one should (1) remove the contaminating agents and or foreign bodies and apply antiseptics liberally where suitable penicillin locally (2) remove the dead or crushed tissue and the debris (3) promote supply of blood to the part (4) prevent conditions favourable to the growth of anærobic bacteria, as all four conditions favour infection by clostridia.

Besides giving the preventive antitoxin either gasgangrene or tetanus according to requirement liberal local use of penicillin by infiltration by syringe or soakage should be repeated every few hours notably in serious cases. Where systemic infection is suspected as proved by blood culture, count and clinical manifetations intravenous continuous drip infusion of one lakh or more units of penicillin should be given in five per cent glucose saline. In all cases of such continuous drip the saline bulb may be kept covered by a thick lint frequently soaked in ice cold water to keep cool. Blood transfusions may be life saving in anaemic or exsanguined patients. The treatment need be continued till he is afelrile and free from toxæmia. Tetanus in a series was not benefited by penicillin.[20A]

XI. *Spirochætal infection like syphilis, relapsing fever, rat bite fever, yaws, leptospira icterohaemorrhagae, vincents angina etc. are all successfully treated by penicillin, as their respective causative agents are susceptible to penicillin therapy.*

1. *Syphilis*—*A. Early cases*—though enough time has not yet elapsed to assess the permanency of the results of penicillin therapy in syphilis certainly the follow-ups though short, show certainly convincingly effective results. The cures so far achieved appear quite comparable with those of usual bismuth and arsenic therapy. The following lines of penicillin therapy though tentatively followed may and probably will undergo modification in the long-run.

"Penicillin has a profound immediate effect in early syphilis in terms of (a) disappearance of surface organisms from open lesions (b) healing of lesions and (c) a trend toward serologic reversal".

20A. Altemeier (1946 Jan 12) Jour. Am. Med. Ass. 130 P-67.

Usual Routine[21]—Twenty thousand units intramuscularly every three hours till sixty injections are given in seven and a half days have given good results in *early syphilis*. When mapharsen or arsenoxide in 0.04 g dose is given daily along with above dosage of penicillin for eight consecutive days, the results achieved appear better than those got with penicillin alone. Of late some workers appear to have secured good results in early syphilis by thirty consecutive 3 hourly intramuscular injections of forty thousand units each of penicillin; one must wait to assess the permanency of these results.

Time for disappearance of the spirochaetes :—"At the two extremes of dosage—one thousand and forty thousand units, average disappearance time (of spirochætes) varied only from twentyone to fourteen hours."

As to healing of lesions a total dosage of sixty thousand units only in eight days, i.e. one thousand units per dose of injection appear less promt than when combined with arsenicals with three hundred thousand units or 3 lakh units total dosage in eight days which produced healingup comparable to standard chemotherapy.

As to the reversal of serologic reaction :— Bigger individual doses of penicillin appear to produce better and more lasting effect on the serological reversal from positive to negative stage, in some series this satisfactory result may be got even in 95.8 per cent of cases combined penicillin, even when in comparatively smaller individual doses, and mapharsen therapy appear to cause better serological changes and that of a more permanent nature than those got by either alone.

Special forms of early syphilis[22]

(i) out of 13 cases of early syphilis with *positive cerebro-spinal fluid* ten became negative or improved in ten to fifty days of penicillin treatment, three were unimproved.

(ii) of ten patients with acute syphilitic meningitis all improved or got cured by a total dose of twelve hundred thousand units of penicillin in seven and a half days[23].

(iii) In pregnant females with syphilis treated by penicillin the results appear encouraging. A combined mapharsen therapy

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21. Mahoney, Arnold, Sterner et al (1944 Sept. 9.) Jour Am. Med. Ass. p63-67.
22. Nelson and Duncan (1944 Dec) Bull Johns Hopkins Hosp P-327.
23. Stokes, Sternbreg, et al (1944 June 15) Penicillin in the treatment of Syphilis, Read before 94th Session of the Am. Med. Ass. in Chicago.

with penicillin appear better, but how far the results will be permanent it is not yet long time enough to say definitely.

(iv) Congenital dark fieid spirochæte positive psoriasiform syphilides in infants persisting inspite of arsenical and bismuth therapy, got cured promptly by penicillin injections though without any influence on the seropositive stage.

B. Late Syphilis—According to the Penicillin Panel of the subcommittee on venereal diseases, National research council America "Penicillin has distinctly beneficial serologic and clinical effects on neurosyphilis, including early and late manifestations not excepting tabes and paræsis and including asymptomatic neurosyphilis."

"Its action on gummatous manifestation of skin, mucosae and bones are so striking and complete that it seems unnecessary to collect farther cases merely to demonstrate it as such. In ocular syphilis, simple inflammatory processes respond; later and more complicated lesions such as optic neuritides and interstitial keratitis recover; relapse present resistance and residues proportional to damage already done. This statement is probably true of visceral syphilis and of special localised processes and eighth nerve involvement." These remarks made by a highly scientific critical body certainly are very hopeful. Time must pass before one can assess the permanency of these good results. Neurosyphilis is also efficiently treated by penicillin[24].

Dosage and results—Two sets of doses, one group got ten to twentyfive thousand units, another group twentyfive to fifty thousand units intramuscularly three hourly for seven and a half days or longer afforded good results in neurosyphilis with guma etc, demented, paretics, and tabes and meningovascular cases improved also, some considerably others only slightly. But the most outstanding experience gained out of these results is that *unless the individual doses of penicillin are grossly inadequately small repeated injections over a prolonged period or frequently repeated injections gave better results than initial big doses.*

Herxheimer Reaction—As noted during treatment by organic arsenicals, so also under penicillin therapy, sometimes sixty per cent or more cases gave reactions like fever ranging upto 102°F or higher, exacerbation of secondary skin lesions, and sometimes of the cerebral manifestations in neurosyphilis during the first twenty four hours of penicillin therapy. In no case however has this exacerbation of symptoms been alarming

24. Goldman (1945 May 26) Jour. Am. Med. Ass. 128 P-274.

enough to interfere with the subsequent treatment though the dosage of penicillin might have to be reduced temporarily during this period of such short flareup, notably in crebral and other dangerous forms of cardiovascular or meningovascular syphilis with hemiplegia, paraplegia or aortic incompetence etc.

2. *Weils Disease*[25] *or Infectious jaundice* caused by Leptospira Icterohaemorrhagæ—one case was reported to have been cured by four hourly intramuscular injections of fifteen thousand units of penicillin till a total dose of 315 thousand units were given.

3. *Ratbite fever* and relapsing fever spirochaetes are also sensitive to penicillin hence are amenable to penicillin therapy.

4. *Yaws*—out of 17 cases of primary and secondary yaws—treponema pertenue disappeared from the cutaneous lesions as judged from darkfield illumination results within sixteen hours in 16 cases, and within forty hours in the remaining one. Fifteen thousand units intramuscu'arly four hourly for five to six days was the total amount of penicillin given in these cases. Experience suggests that even a total dosage of two hundred thousand units might achieve a cure.

XII. *Peritonitis* :—A combined sulphathiazole and penicillin therapy may save cases of peritonitis which we lost formerly before these drugs appeared.

Tropical ulcer caused by Leishmania tropica infection appear to be benificially affected by simultaneous intramuscular injections and local application of penicillin.

Vincents Angina has been successfully treated by intramuscular injections of 20 thousand units every three hourly till a total dose of one to 20 lakh units of penicillin given.

Actinomycosis—anthrax infection, and infection by clostridium botulinus and by other clostridia already described micrococcic infection, other spriochætal infections, virus infection, of psittacosis and ornithosis are successfully treated by penicillin.

In *cholera infection*—the symptoms appear mostly to be due to the action of the toxins, but certainly intravenous drip of penicillin given along with tranfusion-saline would be worthwhile trying in a large series of cases. The coma bacilli appear sensitive to penicillin hence the above suggested therapy.

Confluent small pox—and small pox at the stage of suppuration, caused mainly by the pyogenic cocci, appear to be very effectively treated by penicillin alone, better still by combined

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25. Hart (1944) Brit. Med. Jour Dec 2. P-720.

injection of sodium sulphathiazole and penicillin. The usual dose for an adult of both the drugs need be given for a week or longer occording to the clinical condition and other indications.

Toxicity and reaction of penicillin :—appear to be due in all probablity to impurities than due to pure penicillin itself, with improvement in quality and the purer the penicillin lesser are these reactions.

Commoner are (1) *skin rashes* of various types like urticaria and other rashes when generalised or exfoliative and persistent may induce discontinuance, at least for the time being, of the injections. (2) *Gastrointestinal reactions* of a mild nature. (3) *Secondary fever* due again to impurities is rare with the pure drug. (4) *Pain at the site of* injection is best mitigated by keeping the inoculum small 2-3 c.c. and applying an ice-bag at the site for fifteen minutes before the injection, later warmth if useful may also be applied after a few hours. (5) Venous irritation at the site of injection specially in continuous drip method. It is not a real phlebitis but irritation of the vein. Frequent change of the site and cleansing the apparatus at frequent intervals will reduce this local irritation considerably; local moist warmth may relieve the pain.

Penicillin and the Physician—A large number of cases which in prepenicillin days required surgical intervention are cured without operation by judicious use of penicillin alone.

N. B.—In such an engrossing subject as the details of the use etc. of penicillin and other antibiotics the views expressed so far are only tentative as newer discoveries and uses are appearing daily in the journals. Nothing should be taken dogmatically, and far from taking them as the last word in this fascinating study.

CHAPTER VII

STREPTOMYCIN

Introductory.

In January 1944 Schatz, Bugie and Waksman[1] suggested that the new *antibiotic streptomycin* would be useful in the

26. Webb (1946 July 13) Brit. Med. Jour p-49.
27. Schwartz (1945 July 7) Jour. Am. Med. Ass. 128 p-704-706.
1. Proc. Soc. Exper. Biol & Med. (1944 Jan. 55 p166-169.

treatment of diseases caused by a variety of gram-negative and some gram-positive pathogens[2]. Though the observations made below may to a certain extent be modified by further work in the future yet most of the facts mentioned are more or less established. An expert Committee on chemotherapeutic or other agents of the National Research Council of America in collaboration with many individual physicians, reported on thousand cases treated by streptomycin. This antibiotic is now available for American private use, and we expect it will be available in India in near future.

List of organisms sensitive to streptomycin[3]

1. Escherichia Coli, 2, Eberthella typhosa, 3. Salmonella paratyphi 4. Salmonella enteritides 5. Shigella dysenteriae 6. Proteus vulgaris 7. Aerobacter aerogenes 8. Pseudomonas aeruginosa (bacillus pyocyaneus) 9. Klebsiella pneumoniae 10. Haemophilus influenzae 11. Haemo. pertussis. 12. Staphylo aureus some strains 13. Mycobacterium tuberculosis 14. Brucella melitensis. 15. Bru. abortus 16. Bru. suis. 17. Pasteurella tularensis 18. Past. pestis. *Most of these organisms are non-sensitive to penicillin.*

Sensitivity varies in strains of the same organism[4]—It has been repeatedly observed that various strains of the same organism differ widely in their sensitivity to streptomycin. Along with this there is the additional problem of variation in absorption and excretion of this remedy by different patients or even by the same patient at different times.

Preparation for injection. Streptomycin is dispensed as sulphate or hydrochloride both being extremely soluble in distilled water or normal saline. Recently metric system has been used to define the unit of potency. It is better stored at 15°C or 59°F. It is not so thermolabile as penicillin.

Units etc :—

But for all practical purposes one may say that one mg of Streptomycin is equal approximately to thousand (1,000) S units, and usually one g of it roughly is equivatent to ten lakh (1,000,000) S units. Usual daily total dose varies from 1 to 3 g or ten to thirty lakh S units. But as much as ten grams daily have been given in some occasions.

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2. Waksman, Schatz (1945. Nov.) Jour. Am. Phar. A. 6 p-308-321.
3. Nicholsand Herrell (1946 Sept. 28) Jour. Am. Med. Ass. 132 p-200.
4. Reimann, Price and Elias (1945 Nov-Dec) 76 p-269-277.

Solution etc :—Concentration of 100 to 200 mgs or one to two lakh units per c.c. are preferred for intramuscular or subcutaneous, preferably for the former route. For *intrathecal* use 50 to 100 mg may be dissolved in 5 to 10 c.c. of saline. It is important to use enough solution so that the preparation is clear and free of undissolved praticles.

Modes of administration[5].

Like penicillin streptomycin is given best *intramuscularly* the site of injection being frequently changed : *subcutaneous* route though useful may have to be given up due to too much local irritation. *There appears no special advantage by intravenous over the standard intramuscular route. Intrathecal ,intraperitoneal and intrapleural routes* are also used according to indication. *Local application* is also given.

In *meningitis* both *intramuscular* and *intrathecal injections are required; intramulcularly every three to four hourly in the above average dosage but upto six hourly when the dose given is very large,* and *intrathecally once* every twenty four hours. In *empyema intrapleural* injections one daily are desirable, whereas in *peritonitis intramuscular* and in some instances *intraperitoneal injections are required.* Given three to four hourly by the *intramuscular route and as the maximum blood level is reached within one to three hours after a single injection* and as slow excretion goes on upto the 8th or 10th hour, these reapeted injections have an *additive effect.* It may be given *intravenously* but must not be in concentrated solution, the day's total dose should be dissolved in 1 to 2 liters of normal saline and given by slow continuous intravenous infusion. As in penicillin therapy, sufficient quantity of *crebrospinal fluid* must be first with-drawn to make space for the 5 to 10 c.c. to be given *intrathecally.*

Inhalation—"Insufflation of nebulised streptomycin directly into the tracheobronchial tree has been an effective method of administration. Concentration of the drug as high as 50 mgs (50,000 units) per c.c. of isotonic saline have not produced irritation of the bronchial tree[3]". A total of upto 500 mgs may be given in twentyfour hours. "It is a curious fact that very little streptomycin is absorbed from the lungs so that none is detected in the blood; some may be recovered form the urine".

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5. Streptomycin in the treatment of infections—A Report of one thousand cases—Committees report. Keefer et al (1946 Sept 7th) Jour. Am. Med. Ass. 132-p-4.
6. Buggs, Pilling, Bronstein et al (Jan-1946) Jour. Clin Invest 25. p. 94-102.

Oral use[7] :—Little streptomycin is absorbed from the gastrointestinal tract; even after large doses, small amounts can be detected in the blood and urine. The amount appearing in the stool following parenteral injection is extremely small, and probably enters from the bile. Following oral therapy the sensitive bacteria of the bowel are greatly reduced in number, hence 2 to 3 g daily doses are given orally in preparing patients for surgical operations on the large gut or in gastrointestinal infections in which it is desirable to reduce the number of the infecting organisms.

Local use :—Streptomycin may be used locally and may be injected directly into empyema and abscess cavities. The usual strength is 10 to 100 mg (ten thousand to hundred thousand units) per c.c. of normal saline.

Distribution in body fluids[8] :—Though, after parenteral injection very little streptomycin diffuses into the spinal fluid yet in meningitis greater amount passes into the spinal theca. Only minimal amounts are found in the blood following inhalation or oral administration. Following parenteral injection, streptomycin passes into the pleural fluid, the peritoneum, ocular fluid and the bile. It has been found in about less than half the concentration of the maternal blood in the cord blood of the faetus within ten minutes of intravenous injection to the mother. When high concentrations are desired it is better to inject directly in the pleural and peritoneal cavities, one every twentyfour hours.

Excretion[9] :—Following a single injection approximately 60 to 80 per cent of streptomycin appears in the urine within a twentyfour hour period, hence urinary tract infections are treated with ease. Small amounts are excreted in the bile and into the pleural, peritoneal, and crebrospinal fluid.

Results of treatment[5] :—

1. *Bacteræmia* :—out of 91 cases of bacteraemia in a series 49 patients recovered and 12 improved, four showed no appreciable effect but survived, 26 died. Majority, that is, eight out of 12 cases due to Friedlander's bacillus recovered or improved cases of H. influenza, E. coli, and some strains of staphylococcus improved or recovered. In another series of 17 cases of bacteræmia 12 showed good, 3 doubtful, and 2 poor results. In

7. Elias, Durso (1945 Jan 8) Science 101 p-589-591.
8. Zintel, Flippin et al (Octo 1945) Am. Jour. Med. Sc. 210 p. 421-430.
9. Heilman, Heilman, Hinshaw et al (Nov 1945) Ibid. 210. p. 576-584.

these series 4 out of 5 E. coli infection, 3 out of 5 Brucellosis 2 out of 2 mixed gram negative bacillary infection recovered or improved.

It appears from these results that streptomycin was important in controlling the infections and thus reducing the fatality rate. Many of the gram negative bacteria invaded the blood from the genito-urinary tract and streptomycin assisted in clearing the blood of bacteria as well as in controlling the local infection. Many factors must naturally have to be taken into account, in assessing the results of treatment by streptomycin, amongst these the important (a) are of the nature, extent, severity etc. of the local original infection, (b) of the species of infecting organism (c) age, sex, presence or not of complicating or debilitating diseases etc. (d) duration of the infections and others.

2. *Typhoid fever*—out of 51 caces studied; in 26 treatment was started before the 18th day of illness, and 18 reached normal temperature before the 28th day of illness. In the other 8 cases the temperature became normal between the 29th to 56th day of illness. In one case treatment being started on the 8th day of illness the temperature reached normal by the 12th day. The blood culture became negative during treatment, but the stools remained positive and were still positive one month later.

In the remaining 25 cases treatment was started after the eighteenth day and the temperature did not become normal until after 28th day of illness.

Dosage in typhoid fever varied from 1 to 5 g a day for a period of 5 to 19 days. Majority received 4 g a day for seven to eight days. Combined oral and parenteral therapy appears no better than injection alone.

Uuless treatment is started within seven days of illness and the effects watched, from the available small data it is difficult to say that streptomycin shortened the course of typhoid fever.

3. *Urinary tract infections*[5] :—In all these infections every effort must be made to eliminate stasis, obstruction and foreign bodies, because their presence hampers treatment.

Out of 409 cases of urinary tract infection in a series there was 42 per cent overall recovery rate. Intramuscular injection treatment was quite successful; the daily dose varied from 0.25 g to 5 g but most of the cases treated received 1 to 2 g daily. Five to seven days was the duration of treatment, receiving an average total dose of 7.5 to 10 g.

Most of these infections were of long duration and usually due to multiple than single organisms, thus increasing the difficulty in treatment. But in short one may assert that in streptomycin *we have a very potent if not the most potent urinary antiseptic.*

4. *Hæmophilus influenzae Meningitis*[5]—out of 100 cases reported 66 got cured clinically and bacteriologically while under treatment, 13 improved and finally recovered under treatment, 1 improved but replased, 3 showed no effect and 17 patients died. Most of the fatal cases treatment was started late and were below two and a half years of age. The *average daily dose in those who recovered was* 0.5 *g intramuscularly* 0.6 *g intrathecally for nine and seven days respectively.* Late treatment shows an unfavourable prognosis. Weinstein also suggests that early diagnosis and prompt intramuscular and intrathecal injection of streptomycin are usually followed by striking improvement. Other superimposed organisms may require *treatment by penicillin*

5. *Meningitis due to Gram negative organisms other than hæmophilus influenzae*[5] :—There were fourteen cases of meningitis—due to alkaligenes fæcalis, E. Coli, Proteus vulgaris, P. morgani, Klebsiella pneumoniae and unidentified gram negative bacilli. Five persons recovered, 5 improved and 4 died. Two of the improved patients replased after the drug was stopped; however both were treated only for two days.

The average dose of streptomycin in this group of patients was 0.5 g a day intramuscularly for nine days and 0.1 g a day intrathecally for six days as they were mostly young persons. In three patients who recovered or improved treatment with sulphonamides and in one case with penicillin as well was carried out concurrently. In almost all these cases penicillin and sulphonamides were tried before streptomycin was started. Though the series of cases are very small numerically yet these otherwise fatal conditions appear to be favourably influenced by streptomycin.

6. *Salmonella Infections*[5] :—Twentysix patients have been treated for Salmonella infections. Ten recovered under treatment, 2 showed improvement and recovered later, 6 showed no improvement and 8 died. Bacteræmia was present in 14 patients. The average daily dose was 3 g for seven days. As the various strains of Salmonella varies in their susceptibility to streptomycin, hence such a large number of fatality.

7. Peritonitis :—Out of 53 patients treated for peritonitis 39 recovered and 12 died. There were only three deaths out of 21

cases with peritonitis following appendicitis. They received intramuscular injections of streptomycin ranging from 1 to 2 g per day for eight to ten days. Twentyone of those who recovered received other forms of chemotherapy at the same time. As streptomycin diffuses into the peritoneal cavity following intramuscular injection, at least 2 g a day should be given for five days or longer. When the infection is a generalised one it may be desirable to inject streptomycin directly into the peritoneal cavity.

8. *Shigella Dysenteries* :—There were two cases, both had positive stool culture before treatment and negative after therapy of 1.5 g of streptomycin a day intramuscularly for five days; both had sulphonamide therapy previously. Treatment with streptomycin was began in the 3rd month of illness in one and in the 5th month in the other.

9. *Tuberculosis*[10]—"Streptomycin is very likely to prove valuable as a palliative remedy in tuberculosis at least because of its apparent suppersive action. It did not eradicate infection. Clinically such a suppresive measure would be of tremendous as a stop gap measure to be taken prior to or following other forms of treatment including surgery"[11]. The results observed in cases of miliary tuberculosis, and tuberculosis of the lungs, meninges, skin, larynx, kidneys etc. streptomycin probably has a bacteriostatic action. In exudative from of tuberculosis in man treatment for a minimum period of 3-6 months with doses of 1.5 to 3 g daily appears useful. *Though not definite yet it appears useful in tuberculosis, but further work is needed for crystallisation of this knowledge.*

10. *Whooping Caugh* :—Animal experimental[12] studies were so encouraging that whcopong cough cases in children are being treated by streptomycin[13]. The results are awaited.

11. *Leprosy*—Streptomycin is likely to be useful here too. In combination with promin group, penicillin, streptomycin may influence the course of this disease.

In short summarising[11] one may say that streptomycin is almost a specific in tularaemia, and quite useful in influenzal meningitis—where both intramuscular and intrathecal injections

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10. Hinshaw and Feldman—(March 1946) Jour. Pediat 28 p-269-274.
11. Keefer et al (Sept 14, 1946) Jour. Am. Med. Ass. 132-Continuation of Ref 5.
12. Bradford and Day (Dec 1945) Proc. Soc. Exper. Biol & Med. 60 p-324.
13. Editorial (March 30 1946) Jour. Am. Med. Ass. 130 p-850

are essentitl. Bacteraemia due to gram negative bacilli and in urinary infecitons streptomycin appears to be the drug of choice, including penicillin therapy for those sensitive to penicillin. The effect of streptomycin in typhoid, salmonella and in brucellosis appears doubtful, and further trial is required. In meningitis caused by gram negative bacilli—streptomysin is the drug of choice again. Pneumoniae caused by Friedlander bacilli and some of the haemophilus group are best treated by streptomycin.

Average dose etc[11].—

	Infections	*Average daily dose in grams*	*Length of Treatment in days*	*Total Dose in grams*
1.	Urinary infections ...	1-3 ...	5-10 ...	5-30
2.	Tularaemia ...	0·5-1 ...	5-7 ...	3-7
3.	Gram nagative Bacillæmia	2-4 ...	5-10 ...	10-40
4.	Influenzal Meningitis ...	0·5-1 g I.M.	5-7 ...	3-7
		0·25-0·05 I.T.	7-8 ...	0·35
5.	Typhoid	3-5 ...	10-14 ...	30-70
6.	Peritonitis	2-4 ...	5-10 ...	10-40
7.	Salmonella	3-5 ...	10-14 ...	30-70
8.	Cholangitis	2-4 ...	5-10 ...	10-40
9.	Undulant Fever ...	4-5 ...	10-14 ...	40-70

Toxic Symptoms—"Untoward reactions are not infrequent and increase in frequency with increasing dosage"[11]. They consist of (a) *Local reactions* like irritation, tingling, paraethesi.

(b) Histamine like reactions—headache, flushing of the skin, nausea, vomits.
(c) Sensitization reaction—skin eruption, fever.
(d) Pyrogenic—fever.
(e) Neurological— vertigo, tinitus, deafness.
(f) Miscellaneous—diarrhaea, albuminuria, fall of blood pressure etc.

Maximum signs cases showed were headache, skin eruptions, flush, tinitus etc.—and that most common in the first week—specially when the dosage was very large.

CHAPTER VIII

TYROTHRICIN

Tyrothricin (P.D. and Squibbs etc) was discovered by Dubos[1] (1939) from gram positive spore forming bacillus brevis

1. Dubos (July 1939) Jour. Exper. Med. 70 p-1-10.

of the genera tyrothrix hence the name tyrothricin formerly called gramicidin due to its marked antibacterial effect against the cocci[2]. Tyrothricin is a mixture of gramicidin and tyrocidine.

Properties—Though fairly thermostable, yet due to its haemolytic effect it cannot be given by injection.

Used Locally.—(1) In aqueous suspension in a strength of 0.5 to 1.0 mg per c.c. for wet dressing on wounds, ulcer etc, it may also be sprayed in the paranasal sinuses, in tonsils, throat, etc. with good results. Instillation into pleural cavity, urinary bladder is practised. (2) Watery solution is also used for the above purposes. (3) Local insufflation into the vagina of a boric powder, contaning 500 mg of tyrothricin in 100 g of boric acid has been found useful for local infections. (4) An ointment of tyrothricin is also useful for local application.

Effective against[3]—diplococcus pneumoniae, strepto and staphylo coccic infection of wounds, ulcers, certan skin diseases caused by these organisms; also useful in infections in the nose, throat, sinuses, conjunctivae, etc. within the reach of local application. To be effective tyrothricin must come in direct contact with the infecting organisms. Post-operative infection of pilonidal cysts have been ably treated by packing the wound with gauze soaked in 15 to 20 c.c. of a tyrothricin suspension conaining 33 mg of tyrothricin per 100 c.c.[4]

Conclusion :—Except the advantage of thermostability, hence quite usuable in ear, nose, throat and local infections with ease, tyrothricin appear to possess very little superiority to penicillin—specially for local use.

CHAPTER IX

MALARIA

DIAGNOSIS IN SHORT.—

In benign tertian and *quartan malaria*—the clinical signs and symptoms differ from those of malignant tertian infection.

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2. Dubos and Hotchkiss (April 1942) Trans and stud. Coll. Physicians, Philadelphia 10 p-11-19.
3. Rammelkamp (Sept 1942) War. Med. 2 p-830-846.
4. Berger (1945) W. S. Nav. M. Bull. 44 p-952.

Residence in an endemic zone of malaria, history of previous attacks, and in benign tertian and quartan infection the characteristic history of the primary fever, coming generally in the forenoon, usually with three clear-cut stages,—namely cold, hot and sweating, the duration of fever about eight to twelve hours, the periodicity of fever, coming every, forty-eight hours in benign tertian, and seventy two hours in quartan malaria, are suggestive. Such signs and symptoms like, vomiting, headache, jaundice, coated tongue, constipation, anorexia, enlarged spleen, and the liver in acute stage, anæmia and others are important aids in diagnosis.

Malignant Tertian Malaria.—Unlike the other two types, already mentioned the onset may be at any time of the day or night, usually without any or much chill or rigor. The headache, vomiting, burning sensation of the body and often other severe subjective symptoms, quite out of proportion to the degree of fever, may be very helpful clinical points in diagnosis of this, rather serious type of malaria. The duration of fever is longer, and may extend in the majority even upto two, three days. There may sometimes be noted quotidian or remittent periodicity, hence the importance of remembering these three types of temperature caused by this serious infection. The three characteristic clear cut stages so typical of the other two infections, may partly or completely be lacking in this. In severe but atypical forms of malignant tertian infection *termed pernicious, or subtertian malaria,* besides the above groups of clinical symptomatology, anaemia, icteroid tinge of the conjunctiva, and a palpable spleen may be helpful in diagnosis.

Finding of parasites and Therapeutic test.—

But one cannot stress too strongly on the importance of finding the parasites in the blood under the microscope, the eye of the doctor. No doctor practising in the tropics can do without this valuable instrument., In bad cases repeated, even six hourly examination of the blood flim may save the life of the patient. But it should also be made clear that when clinically diagnosed, negative finding of the parasites, does not necessarily prevent the doctor from trying therapeutic tests. Because a person like Osler said,[1] "Any fever which resists the action of quinine properly administered for more than four or five days is not malarial in character". The parasites though may not be encountered in the peripheral circulation, where

1. Osler's Modern Medicine—Vol. II, Malaria fevers, Craig (1925)—p. 333. Lea and Febigers' publication. Philad and N. Y.

even small doses of quinine have been exhibited. Recently plasmodium ovale is being described again[2].

So the diagnosis depends mainly on.—

(1) Clinical findings (2) parasites in the blood (3) pigmented leukocytes—specially the large mononuclears when increased above thirteen per cent or more (4) response to proper doses of quinine, administered suitably, but here the possibility of fever of short duration should naturally have to be excluded. Cultivation of the malaria parasites by Bass and John's method[3] is not as a rule practicable except in well equipped laboratories.

Differentiation has got to be made from all other fevers of short duration—like influenza, dengue, also, all pyogenic infections, tuberculosis, amoebic-hepatitis, kala-azar, typhoid fever and others.

TREATMENT

Prophylaxis.—[4,5]The measures are (1) draining of breeding places (2) clearing out of bushes, small plants, jungles and so on, acting as shelters of the mosquitos, (3) oiling of pools and puddles,(4) use of larvicides like—sulphurous acids, potassium permanganate acted upon by hydrochloric acid, sulphate of iron and copper, formalin, aniline, kerosene or fuel oils; and most effective is recent D.D.T; service of mosquito brigade—for the destruction of shelters and breeding places, by a group of specially trained men; (6) breeding of larvicide fishes; (7) destruction of mosquitoes; by gas or fumes; (8) screening of houses, so that mosquitos can not reach and bite the infected persons; (9) isolation of the carriers beyond the reach of these insects; (10) use of plasmoquine or pamaquin or paludrine, to sterilise the patients, and asymptomatic carriers blood of the gametocytes; (11)educating the public to the danger of the presence of the carriers; (12) to try to sterilise the blood of the mass in an endemic locality, combined with measures against the mosquito.

Prevention of Mosquitos by D. D. T. :—

Recent trial on dichlor-diphenyl-trichlor-ethane in short called D. D. T. due to its lethal effect even when present in

2. Manson-Bahr and Muggleton (1937) Brit. Med. Jour. 1 p. 217.
3. Bass and John's (1911 and 1913) Jour. Amer. Med. Assoc. (1911 57: p. 1534 and also, Amer. Jour. Trop. Dis. and prevent Med. (1914) No. 546.
4. Satyanarayana (1934) Rec. Mal. Survay of India, 4 Dec. p. 343.
5. Sinton and Mujid. (1935) Ibid. 5. March 3.

traces on the mosquitos in their various stages of development, has prevented the spread of malaria—specially in an epidemic form.

Personal Prophylaxis :—

This consist mainly in protecting oneself from being bitten by mosquito.

(1) Travel when malaria is least prevalent, preferably during the day time than at night. (2) Houses and camps should be away from any stagnant collection of water. (3) Sleeping under mosquito-curtain and on the first floor or higher up. (4) Fans or pankhas tend to keep the mosquitos away. (5) Use of preventive drugs like mepacrine, paludrine and pamaquin.

Suppressive Treatment of Malaria[6] :—

Mass trial in army has proved that one 0.1 g or 1.5 gr. tablet of mepacrine hydrochloride taken after the last meal at night, six days in the week, practically suppresses all forms of malaria, though useful in army and labour force as an emergency[7] procedure may not be ideal, because though plasmodium falciparum infection may not recur, but pl. vivax infected cases may show a relapse rate of even upto 95 per cent when the treatment is given up for a month. By suppressing these febrile paroxysms the human system is denied that acquirement of adequate defence resulting from these attacks so essential for cure of malarial fevers.

According to others prolonged suppressive treatment of 8 to 36 months even had practically no evil effects.[8] But paludrine is truly suppressive. (see paludrine).

Curative Treatment :—

There is hardly any subject in medicine, on which there is so much difference of opinion, as to the best method of treatment, as there is in that of malaria· So one has tried in the following pages to give some standard idea given vent to by several experienced workers, naturally modified according to one's own little experience.

General Measures.—

The patient should be put to bed, notably in all acute cases, as it enables the doctor to watch the effects of treatment and the patient gains by conserving his own strength.

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6. Jour. Amer. Med. Ass. (1943 Sept 25) p-p. 205-208.
7. Amer. Year. Book of Medicine (1944) p-59.
8. Drew and Reid (1945) Lancet 2 p-107.

Give antimalarial immediately in bad cases.—If the case appears to be severe, or the subject a newcomer in the endemic area, no time should be lost for the preliminery purgation and alkaline treatment, and quinine or other anti-malarials given by the most quickly effective route.

In average cases.—Average benign tertian and quartan infections are not, generally so severe, and the patient if seen during the acute febrile stage may be treated in the following plan.

(a) *Relieve some of the distressing symptoms* and try to relieve polycholia and deplete liver of pigments and cause evacuation of the bowels, because for quick absorption and assimilation of quinine and other specific drugs these are important pre-requisites where possible.

Headache and burning sensation during the height of fever

This is due partly to sudden liberation of such a lot of foreign protein and other substances, and may, to some extent, be relieved by a powder like the following, which also helps the evacuation of bowels.

Hydrarg subchloride	gr. ¼
Phenacetin	gr. 1
Aspirin	gr. 1
Caffein citrate	gr. ½
Soda bicarbonate	upto gr. 6

one powder every half an hour to an hour, till two to six are taken according to age, state of illness, severity of the symptoms and so on. Malarial headache has been beneficially treated by Zelings (1945)[9] by hundred mg of nicotinic acid daily per oral route.

Vomiting etc.—

Along with the above powder, glucose drink, or where it is not available—sugar or sugarcandy water, with lemon juice, (the latter helps in alkalinising the system) and salt added according to taste, may help in reducing the *burning sensation and vomiting.* It appears that as soon as the liver starts storing glycogen, most of these distressing symptoms of the patient begin to disappear. The vomiting in malaria is usually bilious and may be only an effort to get rid of the extra bile formed through the destruction of numerous red-blood corpuscles, liberating such a lot of pigment and haemoglobin. Vomiting is generally a temporary,—but

9. Jour. Am. Med. Ass. (1945 Nov. 17) 129. p-796.

sometimes distressing symptom, except in the bilious remittent manifestation of malaria, where it persists for some days even, requiring injection of quinine.

During fever a suitable alkaline mixture, plenty of glucose or sugar, which helps storage of glycogen in the liver, freely acting bowels, are generally sufficient to relieve most of the distressing symptoms of the patient.

The following is an example of an average alkaline mixture.

Potassium citrate	gr.	15
Sodium acetate	gr.	30
Liquor ammon acetate	m	60
Spirit nitrous ether	m	10
Syrup lemon	fl. dr.	1
Cinamon water	upta fl. oz.	1

one dose every three to four hourly during fever; and also an hour before taking the dose of quinine or other antimalarials during the afebrile period, because quinine appears, at least, clinically, to be more effective, when combined with alkaline treatment, purgatives and preceded by calomel, than when used alone. Craig (1925) also subscribes to this clinical experience. "It is well to secure a complete evacuation of the bowels with or before the administration of quinine. The administration of calomel, until bowels move freely renders the action of quinine much more efficient. It hastens and favours the absorption of the drug." Calomel in divided doses of $\frac{1}{2}$ to $\frac{1}{4}$ gr. repeated every half an hour or one hourly, till a total of one to two grains are given, is quite suitable for this purpose. It should be followed by saline purgatives.

Diet, Fluid etc.—During the acute febrile stage, liquids should be given, as much as the patient can take. Cold water, barley water either with lemon juice and salt, or barley water and soda-water or milk and soda, later glucose water, green cocoanut water where available, sugar or sugar candy water with lime juice,are soothing. These liquids help in getting rid of the injurious agents and promote diuresis. Lemon juice, juice of shaddock (Batapi) act in the same way as other alkalies, because citric acid is absorbed and acts as an alkali. When the fever is gone and the patient feels better, milk and sago due to the latter's laxative qualities, or bread and milk, or decoction of lentils, but-

10. Osler's Modern Medicine—Vol. II. Malarial fevers. Craig (1925) p. 341. etc.

ter-milk, ice-cream, baked-custard etc., may be allowed. Solids are better avoided till the patient remains fully afebrile for two days, because not uncommonly one notices that overloading the stomach with rice and curry, specially if associated with constipation, helps in bringing about a relapse. Dry diet, like chapati and curries, somehow, is not so unsuitable as rice. The latter should at the early aferile period be better granted only during the noon meal. It is desirable that the patient should not overload the stomach. In chronic cases all vitamins should be given.

Constipation.—In all forms of malarial fever, there is a tendency towards constipation, and when not properly relieved, tends to cause relapse. Hence during the whole course of treatment this should be carefully avoided. Probably, freely moving bowels absorb and assimilate quinine better than when the person is constipated, and thus the relapse is prevented. Fatigue, cold, over-work, worry, surgical operation, sea voyage may cause replase hence antimalarials are indicated.

Quinine and other specifics—etc.—

Some advanced ideas[11].—We have got much new light on treatment from the report on malaria, by the com mission of League of Nations.[12] This is a mine of information and those who are interested may read it with profit. Some of the very important items are summarized below.

1. Quinine has got no appreciable effect when given during the period of incubation and little effect during the first few days of fever. 2. It is a common error to think that earlier the specific is exhibited the better is it's curative effect, but the truth is more or less in the reverse, except in those cases, where the body is over-whelmed by a severe parasitic invasion. As has been emphasised, that diseases get cured by the development of body-defences, so also, quinine acts better in conjunction with the gradually developing defensive mechanism of the system, evolved out of the fight with the protozoa. These defensive forces gradually better themselves and get an upperhand along with the

11. James and others (1932) Quarterly bull. of the health organisation of the League of Nations—2. (2). January 1932.
12. Hoops (1933) Malayan. Med. Jour. Dec. 8: No. 4. p. 219-235.

paroxysms of malaria.[13] So treatment should aim at formation of the power of tolerance (immunity) against the parasites. 3. The patient should be in bed and the type of the infecting parasite ascertained. 4. Relapses are more amenable to therapy than the primary attack. 5. It has been proved that larger doses of quinine are not more effective than moderate doses, and that treatment for too long a period may suppress the host's natural defences. 6. Hence, according to them, curative treatment should not exceed seven days at a time, initially. An interval of seven to ten days in between two courses appears as effective in preventing relapses as a continuous medication for some length of time. 7. The acute primary attack, they say, is better treated by quinine alone, and the administration of the recent remedies like pamaquin and mepacrine is better deferred until, the acute stage of the disease has been over-come. 8. If one specific is to be used, which is the one of choice? The committee states, that for primary infection by plasmodium falciparum (malignant tertian),mepacrine is more effective than qninine or any other drug hitherto known. The usual dose though is 0.1 g. or 1.5 gr. thrice daily after food, for five to seven consecutive days, yet two tablets, that is 3 gr. thrice daily after food has been advocated for the first day or two. They suggest 0.2 g. or 3 gr. intraveously followed by oral use of mepacrine. 9. In benign tertian and quartan malaria there is no unanimity as to the choicest remedy, because of these parasites, after a few paroxysms, are naturally liable to produce no fever, even without much treatment. 10. Alternate use of mepacrine and quinine in succession, is suggested, because they think *mepacrine to be better than quinine in relapses*.

Some important working details in Quinine therapy.—

Quinine has got numerous salts, of which sulphate is the cheapest. For an average Indian patient five to seven grains of sulphate dissolved and as given below, thrice daily apears effective. The big ten to fifteen grain doses are not only unnecessary, but, according to expert opinion, are actually injurious, as they hamper the formation of defence of the system, upon which the ultimate cure of malaria, as of all other diseases, depend. During the acute stage it is better given, either at the decline of the fever, or just at remission, in somewhat like the following from thrice daily, alternating with an alkaline mixture, given an hour before.

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13. Sergent (1935) Riv. di. Malariologia. 14: ii (suppl to No. 3).

Quinine Sulphate	gr. 5 to 7
Acid Sulphuric dilute	m 10 to 15
Glycerine	m 15
Peppermint water	upto fl. oz. 1

Those who are susceptible and easily suffer from cinchonism—such as partial deafness, dizziness, ringing in the ears, and so on, may try quinine hydrobromide, in usual doses, and or may take a mixture like the following:—

Calcium lactate	gr. 10
Sodium bromide	gr. 10
Tincture belladonna	m. 5
Syrup Zingiber	m. 60
Camphor water	upto fl. oz. 1

one dose an hour before each mark of quinine mixture, notably when sulphate or hydrochloride is used, instead of the hydrobromide.

Average dosage.—

It has been already suggested that an average person requires five to seven grains of quinine thrice daily. Overweight robust persons, more than twelve stones may require even ten grains, whereas under-weight males and average females may not require more than five grains. For persons, of eight to twelve years—three to four grains, two to four years two to three grains, under two years—one half to one grain, thrice daily, may have to be given. But it is worth noting that in the case of quinine therapy, the dosage has got to be comparatively large, in comparison with the age and weight of the patient.

Pills and Tablets of Quinine. These are better avoided in the acute stages, as there is the risk of their passing out undissolved, specially this may occur in the case of the sugar-coated old tablets. When unavoidable, the pills should be inspected by the doctor himself and be satisfied as to their solubility. If these tablets are crushed and taken with lime juice absorption is better. During the acuter stages, specially in more severe attacks, where immediate action of quinine is essential for the safety of the patient, these tablets and pills should better be avoided. Subsequently when the action of the calomel, alkalies and purgatives start and the tongue becomes cleaner and appetite returns and the fever is controlled, these tablets and pills of good solubility may be prescribed.

Course of Treatment.—Seven days quinine treatment, thrice daily during the febrile period and continued for one

to two days after the fever is gone, subsequently twice daily after food, may be quite effective. A period of rest for seven days, to be followed by a mixture like the one given below, twice daily after food, may be of use. Due to it's properties of relieving constipation and for the iron and arsenic content the following prescription may be of service, in *all sub-acute and chronic cases of malaria.*

Quinine Sulphate	gr.	5
Dilute Sulphuric acid	m	10
Ferrous Sulphate	gr.	2
Magnesium Sulphate	gr.	30
Liq. Arsenic (B.P.32)	m.	3
Glycerine	m.	20
Peppermint water	upto fl. oz.	1

This mixture taken twice daily after food for a week, to be followed by a week's rest, then one dose at bed time, for one week, cures most of the cases. But benign tertian and quartan malaria, fevers are relapsing in nature and for these relapses mepacrine may prove useful. Quinine while given without toincs and purgatives may not be properly assimilated and relapses may occur during the period of rest.

Chronic Malaria—may result from recurrences, relapses, reinfection etc. and as all cases of malaria, specially benign tertian and quartan fevers recur very frequently it is advissable to keep the patient fit and the above prescription, due to tonic antimalarial and laxative effects helps to cure chronic cases by building up the defence of the system, on which the ultimate cure of all diseases including that of malaria depends.

Mepacrine or paludrine given along with tonic laxatives one dose at night after meals may prove more effective in preventing reinfection and relapse etc. As a matter of fact 100 mg of paludrine once a week may keep one free from malaria if taken regularly almost indefinitely.

Ascoli (1937)[14] suggested gradually increasing doses of adrenalin intravenously begining from 1/100 mg daily, 1/90, 1/80, upto 1/10 mg the last dose being maintained for 20 days. The total number of injections is about thirty. In patients of chronic malaria with enlarged spleen these injections causing contraction of the hypertrophied organ expel the malaria parasites to be destroyed by antimalarials in circulation.

14. Presse Medicale—Paris (1937) 45; Dec. 18th., p. 1827

I have tried the above lines of treatment in several of my cases but most of them cannot tolerate more than the first few doses of adrenaline. In some, these doses produce pallor, trembling, pain in the chest and head immediately following the intravenous adrenaline injection. The spleen also shrinks in size. In three out of seven cases in whom the treatment could be continued there was improvement. I am trying now ½ gr doses of ephedrine orally in place of adrenaline per vein.

Severe forms of malaria, comatose, algid, hyperpyrexial cerebral and other forms.—They demand immediate administration of quinine or other antimalarials. When the temperature is very high, ice cap over the head, and warmth, in the form of hot water bottles etc. may be applied to the lower limbs. In bad protracted cases of hyperpyrexia cold sponging, cold rectal saline—may have to be tried. In cases of collapse with subnormal temperature, proper covering the body, hot water bottles, electric baths where available, may be of use.

Intravenous use of quinine.—It is safely given in the following manner. About five to ten grains of quinine bihydrochloride, preferably quinine bihydrobromide, dissolved in two to three c.cm. of water, is drawn into a ten, better twenty c.c. syringe. Along with it is taken, five to fifteen c.cm. of ten to twenty-five per cent glucose solution and one to three c.cm. of calcium gluconate solution of any strength. If the heart appears weak, an injection of coramine or strychnine and digitalin, one hundredth of a grain each is given first, half an hour following this is given the above mixaure in the syringe, per vein, two c.cm. at a time at every ten to twenty seconds' interval. During the whole process an assistant feels the pulse. Any irregularity or unusual symptom complained of by the patient, should make the doctor stop pushing forward the piston, till these untoward effects pass off. I have given numerous injections of quinine intravenously by the above method even in algid cases.[15] If the heart appears unduly weak, quinine per vein should follow intravenous glucose and strophanthin therapy. For the weak heart about fifty or more c.cm. of twenty-five per cent glucose with two hundred fiftieth of a grain of strophanthin or other stimulants may have to given intravenously. Fall of blood pressure may be a risk after intravenous quinine, to be combated.

15. Dhar (1931) Ind. Med. Gaz. June, 66. 6.

Indications etc.—

Intravenous quinine therapy may be necessary in cases where there are too many parasites in the peripheral circulation and where quick or immediate action is essential to save the patient from a comatose or algid, or hyperpyrexial or cerebral or such like pernicious form of attack, caused as a rule by the plasmodium falciparum, the parasites of malignant tertian malaria. Some workers are of opinion that parasites may appear in the blood eighteen hours after an intravenous injection of quinine. Pharmacologists[16] tell us that intravenously given, quinine is excreted very quickly, hence has got to be repeated every four hourly intravenously and eight hourly when given intramuscularly.

In cases of *cerebral malaria* Umanasky (1931) suggested intravenous injection of three to five c.cm. of a forty per cent solution of urotropine to improve the unconsciousness, though it has no effect on the parasites and the pyrexia.

Intramuscular injection of quinine.—The concentrated solutions of quinine sold in ampoules in two c.cm., are better diluted with sterile saline or distilled water to five to ten c.cm. and given intramuscularly into the upper and outer quadrant of the buttocks. The suitable place for intramuscular quinine injection is about two to three inches medial to the anterior superior iliac spine, and about the same distance below the iliac crest. Every sterile precaution should be taken, and the part when well massaged and fomented, after injection, the absorption of the drug is hastened and hence should always be done. Once the needle is inside the muscles before injecting the fluid, the piston should be withdrawn to ensure that no blood flows inside the syringe, indicating that a blood vessel has not been punctured. Intramuscular injections, without this precaution may lead to a fatal issue, and in this particular instance due to sudden entrance of concentrated quinine solution into the circulation.

Intramuscularly it is generally given where, though the symptoms are not very urgent, yet quinine cannot be retained either due to persistent vomiting or diarrhoea, or other causes of failure of absorption or where the drug is not taken willfully.

A few very important practical points to remember are that once hyperacute or pernicious symptoms like coma,

16. Cushny, Text book of pharmacology and therapeutics 1934. 10th Edition, p. 541. Churchill publication.

convulsion, or collapse etc. have developed in a patient a medical emergency has occurred and the prognosis is very uncertain and that he may require, four to six hourly intravenous, due to quick excretion of quinine out of the system, or eight hourly intramuscular injections of ten grs. of dependable quinine till two to four or more such injections are given, to be followed up by oral therapy. In urgent cases treatment may have to be started intravenously every four to six hourly specially in nonimmune foreigners or newcomers to be followed up by intramuscular or where possible by oral medication. To give one injection of ten grs. of quinine daily is to court failure due to insufficiency of the specific. Usually incredibly large doses of quinine are required and that for a prolonged period once pernicious symptoms specially coma and dehydration have developed. In children 3 to 5 grs. for average adult ten grs. per injection should be adequate.

Intravenous glucose upto 500 c.c. of a 25 per cent or twelve and a half per cent, with saline subcutaneously, per rectum or judiciously intravenously or intranasally through Ryles tube may save the *dehydrated collapsed malaria* patient. But a collapsed patient's system has been used to a small volume of blood, to push in large bulk of saline intravenously may throw too big a load for the heart and circulation to bear hence tre need for caution. Stimulants may be given according to indication.

Risks of quinine injection.—It should be remembered that quinine given orally in the proper way, is very readily and effectively absorbed, hence injections should never be given lightly, not to speak for the sake of injections only. Some workers, go so far as to suggest that quinine injections given without sufficient indication, amount to malpraxis.

The risks of injection may be :—

(1) Persons sensitive to quinine may suffer terribly, and intravenous injections may even kill such patients. (2) When given per vein, there is much lowering of the blood pressure. (3) Intravenously given, quinine is rapidly excreted. (4) Unless the sterile precautions are perfect there is not only risk of sepsis, but even tetanus may follow.

Bilious remittent form. The dilious vomiting is generally an effort on the part of nature to relieve the congestion and excess of pigment in the liver. For this purpose the prescription containing divided doses of calomel, given with other drugs like the following may prove of use.

Calomel	gr.	1/8
Menthol	gr.	1/8
Chloretone	gr.	1
Soda Bicarb	upto gr.	4

one powder every half to one hourly, till four to eight such are given, according to indication. The other measures, to allay vomiting, suggested under the treatment of this symptom in cholera and blackwater fever, may be consulted. Alkalies and glucose are of special value.

Some workers think, that due to the increased bile-content, in these bilious remittent attacks, the coagulation of blood is delayed, and intravenaus quinine administration may be dangerous, so they suggest intramuscular injections of quinine for these cases where specifics need be pushed. But as soon as possible, in these patients, as in all other forms of malaria, the specifics should be given orally, preceded by calomel, purgatives and alkalies. Hypoprothrombinaemia due to K vitamin deficiency is common in all cases of malaria with haemolytic jaundice[17].

Qninine in malaria with pregnancy.—About twenty-five per cent of the babies born of pregnant malarial mothers die of this infection in the first week though transmission through placenta is not usual. The lay belief that quinine, specially in small therapeutic doses, causes miscarriage, is untenable. A far worse cause of premature delivery is malarial paroxysm[18]. At the third and seventh months there are risks of miscarriage naturally in some persons, with such history, and better to be on the safe side in all cases of malaria in pregnancy, one may give quinine in one of the following ways.

Calcium lactate or Gluconate	gr.	5
Pot. Bromide	gr.	5
Soda Bicarb	gr.	10
Glucose Powder	upto gr.	30

This powder, each along with small divided doses, say two to three grains of quinine, three or four times a day on the first day, the second day three grains, four to five times, the next day four grains, are given three to four times. Quinine hydro-bromide appears better than hydro-chloride for pregnant patients. The dosage mentioned for the last

17. Eckstein and Nixon (1946 March 23) Brit. Med. Jour. p. 432.
18. Reed (1940) Jour. Am. Med. Ass. August 24. 115. p. 602.

day should be continued for two days after cessation of fever, along with powder mentioned above. Subsequently the dose of quinine may be reduced to three to four grains, three or four times respectively per day. The patient is to be strictly confined to bed during the whole course of quinine treatment. Strong purgatives should be avoided, and plenty of water and milk given to drink. *In cases where there is any risk, mepacrine better paludrine in proper doses is quite effective, safe, and harmless.*

Cinchonism, Idiosyncrasy, Otitis Media— etc.—

In, quinine sensitiveness, purulent otitis-media, or chronic middle ear disease, exhibition of quinine is risky Three cases of complete deafness resulting from quinine medication, in subjects of malaria, with middle ear disease, came under my observation. *Idiosyncrasy* or sensitiveness may manifest itself in, such as, naso-respiratory catarrh, urticaria, vomiting, diarrhoea, sudden dyspnoea, in the susceptibles after quinine administration. *Cinchonism*—occurs more or less in most people, on even moderate doses of quinine. This passes off almost as soon as the drug is discontinued. Ten grains each of calcium gluconate, potassium bromide, sodium bicarbonate and one eigth of a grain of extract belladonna *siccum* in a powder form thrice daily may be tried in these cases of sensitiveness and idiosyncrasy or tendency to easy cinchonism. But these difficulties may easily be overcome by the use of mepacrine, instead of quinine. If quinine has got to be used, bromide of quinine appears better than other salts. Caffeine citrate is said to be an antidote to cinchonism.

Time of Administration of Quinine or other antimalarials like mepacrine.—

For the ambulant patients who are doing their work, quinine is best given as the last dose of medicine at night, or one dose after each principal meals, that is, twice daily, and this may not be resented. For the treatment of the acute attacks of benign tertian and quartan malaria, where paroxysms at the primary onset come in the forenoon, quinine may advantageously be given one dose before retiring at night, next dose early in the following morning, another dose three hours after. This ensures the maximum concentration of the specific in the blood at the time the parasites break, and the young, but vulnerable ones are free in the circulation. In malignant tertian infection the parasites go on sporulating in the internal organs almost all day and night, hence in these cases the doses of quinine, are best

given evenly distributed during the whole period of the day, say every six to eight hourly. It may also be mentioned, that in this infection the result of quinine treatment is more satisfactory than that of the other two rather benign types of malaria. Because quinine reaches in effective concentration in the internal organs where these parasites of malignant malaria mostly sporulate, thus causing their easy destruction. Mepacrine stays longer in the system hence may be given in equally spaced doses as usual.

Disguising the taste of Quinine.—

There are several methods of disguising the taste of quinine. Some of the important ones are given below:—

First method.—When half an ounce of each of the two mixtures given below are mixed, effervescence takes place, this when drunk off while effervescing, covers partly the bitter taste.

Quinine hydrochloride	gr.	5
Citric acid	gr.	15
Distilled water	upto fl. oz.	½

Potassium bicarbonate	gr.	20
Syrup	m.	60
Distilled water	upto fl. oz.	½

Second method.—Quinine when mixed with milk does not taste so bitter.

Third method.—Glycerine in one to two dram doses mixed with either mixture or powder quinine, helps in disguising the taste of the latter.

Fourth method.—An emulsion of half a dram of quinine powder either in an ounce of olive oil or liquid paraffin helps in masking the taste.

Puerperal stage and after Surgical interference.—

The strain of child birth or surgical operation on the system, may bring about a relapse of malaria. Here five to seven grains of quinine, last thing at night, preferably with mild purgatives, iron and arsenic may be of use. The prescription given for sub-acute and chronic malaria with purgatives, tonics and quinine, once at night, mentioned already, may be quite useful. Mepacrine or paludrine may be effective also.

Sinton's method of Treatment.—

The principle is based on the fact that quinine with alkalies is more effective and tends to produce less of relapse.

His routine.—Three grains of calomel are given at night (this dose appears too big for an average Indian) followed by an ounce of magnesium sulphate in the morning.

Three doses of the following alkaline mixture, every two hourly, commencing from 7-30 A.M.

Sodium Bicarbonate	gr.	60
Sodium citrate	gr.	40
Calcium Carbonate	gr.	3
Water	upto fl. oz.	1

within ten minutes of the last dose of the alkaline mixture, one ten grain dose of quinine sulphate mixture, then another dose of quinine preceded by a dose of the alkaline mixture is given in a few hours.

The whole course consists of a total of one hundred and eighty grains of quinine; ten grains, twice daily on the first day, thrice daily for the next four days, then again twice for the two following days.

This dosage appears rather too big and requires reduction, according to body weight of the average Indian, specially in the light of the report of the League of Nations' expert committee.

Cinchona febrifuge.—

This is the total alkaloid of the cinchona bark—out of which most of the quinine has been extracted. It's composition varies according to the country in which it is produced. The Indian variety contains, on an average, quinine —7.4, quinidine—22.1, cinchonine—18.5, cinchonidine—5.8 and ash—45.0 per cent. A good specimen should contain about sixty per cent of total crystallisable and the rest of noncrystallisable alkaloids. Java cinchoni febrifuge contains about fifteen per cent of quinine and is a fairly useful anti-malarial drug. Being cheap it is very suitable for anti-malarial treatment campaign in the masses. The following is a modified prescription used in the School of Tropical Medicine, Calcutta, for the treatment of benign tertian and quartan infection. Against these infections cinchona febrifuge is said to be of greater use, than in malignant tertian malaria where quinine is probably better, but mepacrine is still more useful.

Cinchono febrifuge	gr.	10
Citric acid	gr.	20
Magnesium Sulphate	gr.	30
Glycerine	m.	15
Chloroform water	upto fl. oz.	1

one dose twice or thrice daily, after food, for one week.

Due to quinidine content, it tends to give rise more to vomiting nausea and other symptoms of cinchonism than quinine. It's principal constituent, *cinchonine* in the form of hydro-chloride or bromide is used intramuscularly or orally, notably against benign tertian and quartan infections. In susceptibles it may produce even convulsions. *Cinchonidine* is toxic and not prescribed separately. If used in five to seven grain doses and not in ten grains, thrice daily, after some food, cinchona febrifuge may be quite effective for the treatment of the poorer masses suffering from benign tertian and quartan malaria. The vomiting produced by this drug may be checked by suitable doses of tincture opi, adrenalin chloride solution and such like remedies. Bromides, calcium salts, each in ten grain doses also may be useful.

Totaquina.—

This is another form of cinchona febrifuge with greater proportion of quinine, and is useful against all forms[19], except the very heavy malignant tertian malaria. It is given in five to seven grain average doses, thrice daily, for one week.

Some of the Tasteless preparations of Quinine.—

Aristochin (Bayer) is a neutral carbonic ester of quinine. It is claimed to contain about 96.1 per cent of quinine, and is specially useful in pediatric practice. A white tasteless powder insoluble in water but sparingly soluble in alcohol, and is incompatible in acids and alkalies. Dose—for children—of one year one grain, and those of two or three years—require two to three grains, thrice daily. When given with equal quantity of sugar of milk it is readily taken by children. For fussy adults five to ten grain doses thrice daily may be given with some use. Insolubility is it's great drawback and hence at times, may fail to be absorbed, from the intestines. Consequently it is risky to be used in urgent conditions. *Euquinine.*—It is quinine ethyl carbonate and is almost tasteless. Fletcher (1924) thinks it to be as useful as quinine itself, though most other workers suggest that it's dosage should be one and a half times greater as compared with that of quinine. *Quinine tannate.*—Most workers think it to be an unsatisfactory preparation, and hence unfit for use.

Newer Antimalarial Remedies.—

In the first group of experiments, replacement of the

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19. Hicks and Chand (1935) Rec. Mal. Survay of India. 5. March.

heterocyclic links of the quinoline group of drugs by some synthetic preparations resulted in these valuable antimalarial drugs.

Pamaquin or Plasmoquine.—It has a big formula. Though resembles quinine, it is said to have been prepared independently of the cinchona bark. Particularly useful to *sterilise the blood of the gametocytes, notably the crescents.* Though somewhat *effective on benign tertian and quartan schizonts, it was found quite ineffective against malignant-tertian schizonts.* It does not contract pregnant uterus. Being tasteless it is not disliked by children. The dose advocated was two tablets of 1/6th gr. each, after food, thrice daily. Due mainly to its gametocidal effect, pamaquin need be exhibited after a few days therapy by suitable antimalarials, thus allowing sufficient time for the gametocytes to develop; *one tablet thrice daily is quite enough, bigger doses are toxic.*

Action.—How plasmoquine acts, it is not known, but Bass suggested that the tendency towards haemolysis and production of methaemoglobinemia may create an unfavourable environment for the growth and development of the plasmodia, where quinine acts more readly and effectively.

Toxicity and some untoward signs and symptoms[20] *of pamaquin or plasmoquine group.*—Toxic symptoms are cyanosis of the lips, toes and finger tips, cardiac arrhythmia, pain in the abdomen, vomiting, jaundice, haemoglobinuria, methaemoglobinemia, kidney troubles and so on. Optic neuritis, and even total blindness have been known to follow its over use. Some of the commoner untoward symptoms are—,pain in the abdomen, though less frequently met with in persons who take alkalies and drink plenty of water. Cyanosis is encountered in about 4.3 per cent, more noticeable in anaemic subjects. *One tablet thrice daily are quite good gametocidal.* Toxicity increases when taken in association with other antimalarials specially mepacrine.

Limits and uses.—Pamaquin is very useful for getting rid of the gametocytes, hence in the prevention of spread of malaria, it is the valuable remedy. The dosage should be reasonable and the drug should always be given on a full stomach, where possible in combination with quinine. For an adult a total of ½ to ¾ gr. of pamaquin per day may

20. Chopra and Choudhuri (1935) Ind. Med. Gaz. January 1935.

be effective and safe. The least sign of poisoning should promt to discontinue the remedy.

Mepacrine hydrochloride.—It is drived from acridine dye and is effective against all forms of schizonts but has got no action on the gametocytes. The crescents being not at all affected by its use. The expert Committee's opinion, *is in favour of its use in the primary attack of malignant tertian fever.* To be of maximum use, the oral dose of mepacrine should be preceded by the exhibition of alkalies and purgatives as in quinine. One tablet after food thrice daily, making up a course of five days treatment. Hoops (1933)[21] recommended the following dosages; for infants a total of half a tablet, children between one to three years—half to one tablet, three to five years upto one and a half tablet, persons of more than ten years age and adults three tablets, daily. For acute malaria in adults we prefer 2 tablets thrice daily for 2 days, then one thrice daily for 2 to 3 days, subsequently one tablet twice daily for 2 to 3 days, making total of seven days course with bed rest, plenty of fluids, open bowels, and alkalies we find it well tolerated. These daily doses are to be divided into three equal portions—after meals, say every six hourly. The temperature generally comes down in two to three days' time. It has been very useful for the treatment of malaria in pregnancy, black-water fever and quinine sensitiveness. It does not tend to cause haemolysis of the red-blood corpuscles. According to many, mepacrine is the therapy of choice in the treatment of relapse of malaria after adequate quinine medication; we endorse it.

Mepacrine methane sulphonate or Atebrin Musonate (Bayer).— Hay (1935)[22] and others[23] have given injection of it in doses of 0.3 g. dissolved in five to ten c.cm. of normal saline, intramuscularly or even intravenously, with good results. These injections were repeated the next day in a large proportion of cases and were sufficient to control the temperature in the majority[24]. It may not be safe for children[25]. These injections are indicated exactly in those

21. Hoops (1933) Brit. Med. Jour. June 10th.
22. Hay and others (1935) Ind. Med. Gaz. Dec. 1935. 70; p. 12-678.
23. Blaze and Simeons (1935) Ibid. April 1935—70: 4. p. 185.
24. Simeons (1936) Ind. Med. Gaz. March, p. 132.
25. Medical Annual 1937; p. 289.

circumstances which justify quinine by injection such as persistent vomiting, purging, coma, hyperpyrexia and so on. One tablet of mepacrine weighing one and a half grains is said to be equivalent to about six grains of quinine. The course of atebrin treatment should not as a rule be repeated before ten days to a fortnight after completion of the previous course, thus allowing the slow excretion of the drug.

Toxicity.—The colour of mepacrine is yellow and its ingestion causes the tissues such as the skin, conjunctiva and other mucous surfaces *to stain yellow*. The urine becomes yellow too. When this does not follow, according to some, the remedy should be stopped, as it indicates accumulation in the tissues in a concentration which may overstep the limits of safety. Colouration is due to the medicine and not due to damage of the liver. *Jaundice, colic, vomiting and diarrhoea* may appear during its use. These were more pronounced in cases who took both mepacrine, and some combination of pamaquin. The symptoms are said to be due to hyperperistalsis of the stomach and spastic contractions of the intestines.. It has no bad influence on the myocardium, as Chopra and his co-workers (1933)[26 27] have used it without any bad effect, on cases of malaria with endocarditis and myocarditis. In a few weak and cachectic patients mepacrine has caused temporary mental derangement, specially when exposed to the rays of the sun to be cleared up in two to five days time on proper treatment and cessation of the drug.

On the whole, mepacrine is a valuable weapon, in our fight against malaria, specially advantageous in black-water fever, malaria in pregnancy, quinine sensitivensss and so on. Primary attacks of malignant tertian malaria is very well treated by it. The injectable mepacrine is also an undoubted advancement in our therapy against malaria. *It should be used more extensively by doctors and the baseless fears attached to its use are not justified in our experience.*

Army Method of treatment.—World war no. II has naturally brought about certain modifications in the treatment of malaria. It consists of either ten gr. of quinine or one tablet of mepacrine thrice daily till the fever is gone; the above treatment continued for another seven days; two days no drug therapy; pamaquin one tablet thrice daily for three to

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26. Chopra and others (1933) Ind. Med. Gaz.—Aug. 1933 p. 425.
27. Ganguly (1933) Arch. f. Shiff u. Trop. Hygiene 1933—37 : 9, p. 418.

five days to destroy the gametocytes, which tend to form after a few days following or at the latter part of fever. The course thus extends to 12 to 14 days after fever is off.

Paludrine in Malaria.—Besides the prophylactic value of D. D. T. in the destruction of mosquitos at their various stages, the discovery of *paludrine*[28] has been a great step forward in the treatment of malaria.

Chemically it belongs to the group of *biguanides,* quite a new series of compounds tried as antimalarials endowed with great potentialities[29]. It has three more or less important properties not well demonstrated by other antimalarials, including mepacrine. Though the optimum dose of paludrine has not definitely been ascertained yet, the margin of safety being great comparatively bigger doses have been tried without toxicity. The dose generally used has been 50 to 200 mg, though 100 mg is the usual for general use; doses of even 400 to 500 mg have been tried, the bigger doses when repeated produced slight toxic symptoms like abdominal pain etc.

1. *A true causal prophylactic.*—Regular small doses (50 to 200 mg) taken once or twice daily or weekly even, while in a malarious locality gave complete protection. Though this was acheived by mepacrine group, paludrine appears to be effective on the exoerythrocytic phase of malaria, i.e, kills the parasites introduced by the bite of the infected mosquito before the sporozoites can infect redcells[30]. Though mepacrine is used successfully for suppressive treatment, yet when the person ceases taking this remedy there is chance that he will have fever, whereas paludrine appears to sterilise blood of these parasites newly introduced, though for benign tertian malaria this prophylactic action is not always sure.

2. *Very effective curative* :—Actual malarial fevers got clinically cured by 100 mg twice daily for some days, recently it has been seen that one single dose of 200 to 400 mg once only would bring down the temperature[31], which

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28. Adams, Maegraith, King et al, (1945) Ann. Trop. Med. Parasitol 39 p-225.
29. Maegraith, Adams, King et al, (1945) Ibid. 39 p-232.
30. Davey (1944) Nature 153 p-110.
31. Fairley (1946) Researches on Paludrine. A progress report. From H. Q. Aust. Army Medical Research unit (A.I.F.) Queensland.

might show a subsequent rise, but generally without the rigor not to rise up again for a week or longer, subsequent one weekly such dosage suppresses the fever and sterilises the system of the parasites. For plasmodium vivax infection these relapses may continue for sometime, to be successfully treated by one single large dose weekly. The stay of paludrine in the system appears shorter than that of mepacrine, but with better or comparable therapeutic efficacy.

3. *Prevents relapses mostly and also transmission through mosquitos* :—As to the vexed question or relapses specially in benign tertian fever, sometimes showing a relapse rate of fifty per cent or more, paludrine treatment during fever in 50 to 200 mg usually 100 mg doses twice daily for a fortnight reduced subsequent relapses to a good extent. Malignant tertian infections showed least relapses under proper paludrine therapy. Even 100 to 200 mg once a week for several months also tended to reduce relapse rate materially.[31] Though as a gametocide paludrine has practically no effect yet strangely when there is paludrine in the blood, the gametocytes fail to mature in the mosquito's gut. "Fairly and his co-workers therefore conclude that paludrine acts on the developing gametocyte after it has been ingested by the mosquito and not while it is in the human blood stream. Although it is not truely gametocidal, paludrine thus prevents mosquito infection during a therapeutic course and subsequently, until the blood level falls below the effective concentration. It is superior in this respect to both quinine and mepacrine"[32].

CHAPTER X

BLACK-WATER FEVER

(Malarial Haemoglobinuria)

DIAGNOSIS ETC.—According to Krishnan[1] "Black-water fever is probably a manifestation of severe malaria in highly susceptible persons. The requisite conditions for its causa-

32. More about Paludrine (1946 June 15) Brit. Med. Jour. Leading article p-919.
1. Krishnan (1937)—Etiology of black-water fever—paper read in the Calcutta Medical College Re-union 1937.

tion, being a damaged reticulo-endothelial[2] system, altered metabolism of lipoid, phosphorus and glucose and an over production of haemolytic fatty acids''. Fairley (1937)[3] has discovered the presence of pseudomethaemoglobin in the blood of all severe cases. Recently an enzyme has been suspected to help this haemolysis[4].

Whatever may be the underlying biochemical changes, one finds clinically *two very significant factors* almost constantly present in these cases :—

(1) History of repeated attacks of untreated or improperly treated malaria.

(2) Irregular use of quinine.

Without spending any time on diagnosis, for any supposed hypothesis of this serious diseased process, a short clinical description of a typical case may clear up the difficulty, to some extent.

Clinical History.—The patient residing in an endemic malarial locality had attack of malaria off and on, for which he was seldom seriously or adequately treated. In the actual attack the patient felt unwell and in expectation of the oncoming fever took quinine, but all the same, came the fever, with chill or frank rigor, headache, vomiting, thirst etc., and the patient passed urine, sometimes with difficulty, to note that it is of a dark or deep red or black colour in severe cases, or just red or pink in less serious ones. The liver and spleen both may be just palpable and even tender, specially on the following day. Paleness, icteroid tinge, are very suggestive points. During this time about seventeen per cent of cases show malarial parasites in their blood.

Later on, the fever, though lesser than that during the paroxysm, seldom leaves the patient completely, except in very mild cases. If the haemoglobinuria is very pronounced, due to blockage and damage of the kidney tubules, there may be oilguria, pain round the loins and marked restlessness. The tongue is dry, thickly coated by a peculiar furlike deposit, the appearance is anxious, and restlessness is almost invariable. As jaundice becomes deep the urine may either get darker or gradually clears up, according to the type, severity and duration of the infection, and the resistance of the patient and the nature of the treatment adopted.

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2. Krishnan and Ghosh (1935) Ind. Med. Gaz.—70,
3. Nature 1937. 139 : 588.
4. Maegraith, Findlay, and Martin (1943) Nature (Lond) 151-p 252.

Paroxysms of fever with increased darkness of the urine, indicating a fresh bout of haemolysis, may continue, for days, till by one week or ten days time, the patient, pale and ghastly anaemic, cyanosed and exhausted may be carried away inspite of the utmost effort of the physician. But fortunately in the majority of the cases the symptoms and signs clear up and the patient gets well. Except in very persistent and usually fatal cases, the disease is like an explosive attack in which the fever and the haemolysis with a severe damage to the system—are the most striking features. The rest of the clinical picture appears as an after effect of the above dominant changes.

Clinically cases have been classified according to their severity. In the milder ones the pink or red coloured urine clears up in a few to twenty-four hours and the fever also drops to normal. Whereas in the more serious types, repeated paroxysms of fever accompany repeated passage of dark coloured urine which make the outlook gloomy. The disease is common in all endemic areas of malaria and no race appears immune.[5]

Urine.—There are in it during attack methaemoglobin, oxyhaemoglobin, pseudomethaemoglobin, urobilin, and abundance of albumen, the last constituent persisting for days after the haemoglobin has disappeared from the urine. Brown granular debris and tube casts are frequent.

Bad features—of the disease are, 1. Repeated rigors. 2. Anuria or persistent oliguria of a deep dark colour. 3. Cyanosis. 4. Exhaustion with or without hurried respiration. 5. Extreme pallor. 6. Hiccough. 7. Frequent drenching prespiration. 8. Pain in the loins with anuria which is very serious. 9. Pronounced restlessness. 10. Deep jaundice, as indicative of severe haemolysis. 11. Continued pyrexia.

This disease has got to be differentiated from haematuria, quinine haemoglobinuria, bilious remittent malaria, paroxysmal haemoglobinuria, haemorrhage of infective jaundice. Oxyhaemoglobinuria[6] is suggestive of blackwater fever, whereas methaemoglobinuria with cyanosis may mean pamaquin toxicity, hence the importance of ascertaining if the patient received pamaquin before the attack.

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5. Fairley and Bromfield—(1934) Trans. Roy. Soc. Trop. Med. & Hyg. 70 : No. 4, p. 335.
6. Amy (1934) Jour. Roy. Army. Med. Crops. 71 : No. 3, p. 178, 269, 318.

TREATMENT

Preventive—It is imperative that the doctor should impress on all careless patients not taking adequate treatment for malaria, specially in falciparum infection, the serious risks he runs of developing black-water fever a rather dangerous complication. At least in one fatal case of black-water fever the patient told me that he was never told of this nor was he ever warned of this risk.

Quinine should not be given.—As parasites disappear from the blood after a few paroxysms and as quinine appears to be a contributory factor in the production of malarial haemoglobinuria there is now, more or less a general agreement, that quinine should not be exhibited in this disease. Deaderick in his big series of 2007 cases found a mortality of 25.5 per cent amongst those treated with quinine,—against 10.4 per cent amongst those without it.

Mepacrine group.—Those patients who show parasites in the blood, even after haemoglobinuria, may, very usefully be treated either by injection or oral exhibition of mepacrine in proper doses. For the details of this; mepacrine treatment of malaria should be consulted. Paludrine may also prove useful and is expected to be the best antimalarial so far known.

General Measures.—

Rest.—It is unwise to shift the patient for treatment to a long distance during an actual attack, notably in view of the fact that there is not much of a specific treatment to be had by such risky procedure. The weakness,—exhaustion, exposure and anxiety of a transport may cause grave danger to an otherwise simple case.

Absolute rest in bed.—Every possible care in nursing, warmth, suitable covering for the body, are essential. The patient should not be allowed to sit up under any circumstances. Use of bed pans should be insisted upon. Where this is not available the patient may pass his stools on a thick layer of newspaper, or pad or tow or some such suitable device made for this purpose. Straining at stool in a sitting posture may produce syncope even death.

Vomiting.—As constant vomiting or nausea may interfere with the intake of liberal quantity of water—an agent very important in the treatment, one should leave no stone unturned to check it. For this the following powder may not only stop vomiting but may help to cause mild purgation, and also unburden the liver of part of the deposited pigments in it.

Hydrag Subchloride	gr. ⅛
Chloretone	gr. 1
Menthol	gr. 1/16
Sodium Bicarbonate	gr. 3
Sugar of milk	upto gr. 8

One powder every half an hour or fifteen minutes, according to the urgency of the symptoms, till four to eight such are given.

The other methods of combating vomiting are :--

(a) To put five to ten drops of adrenalin chloride solution (1 in 1000) under the tongue—every half an hour, till four to six doses are given.

(b) Tincture-iodine made of rectified spirit. may be given in one minim dose in about half an ounce of water, every one to four hourly, till three or four doses are given.

(c) In very intractable cases the following mixture may be useful;

Adrenalin chloride	m. 2
Tincture Iodine (rect. spt.)	m. 1
Acid hydrocyanic dil	m. 1
Spt. rectified	m. 5
Syrup orange	m. 60
Chloroform water	upto m. 120

One dose every half an hour to two hours till four such are given.

(d) In bad cases the patient may be encouraged to drink one tumblerful of warm water with a pinch of soda in it. This when drunk off,—the patient's stomach comes in contact with a very suitable solution for stomach wash. Almost surely this will be vomited out and the stomach will get rid of the irritant materials and subsequently any mild remedy may allay the vomiting.

Sips of green cocoanut water,—where available may allay the vomiting to a slight extent and is worth trying in all cases. Besides, it is a good form of soothing drink.

Plenty of fluids.—The intense thirst should be thoroughly satisfied by allowing the patient liberal amounts of cold drink. Safe plain water, if cold, is very soothing to the febrile patient, and may be granted as much as he can take, the more the better.

Glucose drink.—In between plain water, a glucose drink made of one to two drams of potassium citrate and four ounces of glucose to a pint of water or normal saline

may be given, with the added advantage of not only supplying glucose, but also combating the loss of alkali reserve of blood. It is a diuretic too. *At least six to ten pints of fluid should be insisted upon to be taken by the patient.* Plenty of *water, glucose and alkalies* are the best weapons in our hands to combat this serious malady. Continuous hydration through intranasal Ryles tube may save the patient. (see p.17 for details.)

Water helps in keeping the kidneys secreting and thus prevents the blockage of the tubules by debris of haemoglobin and such other substances.

Glucose--prevents easy haemolysis of the corpuscles and supplies strength to the myocardium. Once glycogen is made to get stored in the liver, the restlessness and burning sensation of the patient lessen, he feels better, his frequency of vomiting is reduced, and even it may cease. In all grave cases glucose and saline should be given as a routine *orally and rectally.* Where the patient can not take orally and the heart is not bad, glucose in twenty-five per cent solution may have to be given intravenously every eight to twelve hours in fifty to hundred c.cm. or more doses. When there is reason to suspect of a weak heart, fifty to hundred c.cm. of a twelve and a half per cent glucose may be given intramuscularly every six to eight hours. In cases of dehydration, anuria, or oliguria, glucose in ten per cent solution in a pint of normal saline may have to be given subcutaneously in the thighs or in the abdominal subcutaneous tissues. Rectally five per cent glucose saline,—in four to six ounces, by Murphy-drip method, at body temperature, with alkalies, every three to four hourly, may be of considerable service.

Subcutaneous Saline.—Normal saline one pint or more with ten per cent glucose solution, may have to be given subcutaneously, either in the thighs or on the abdomen, every six to eight hours in bad cases, and specially when the urinary output is low or the patient is unwilling to drink much water or when there is much dehydration. Due to the lowered body resistance, unless very strict aseptic measures are taken, there may develop abscesses at these sites of subcutaneous saline injection. Fomentation on the local area soon after the injection may help rapid absorption of the fluid and also prevent sepsis. *Alkaline saline should never be given subcutaneously as it will invariably cause sloughing.*

Alkalies.—Abundance of alkalies, in the from of potassium-citrate, sodium bicarbonate, in an average alkaline mixture like the following is of use, taken four hourly.

Pot Acetate	gr.	20
Pot Citrate	gr.	30
Sodii Bicarb	gr.	10
Liq. Ammon Acetate	dr.	2
Spt. Chloroform	m.	5
Syrup Orange	m.	60
Water	upto fl. oz.	1

In serious cases intravenous soda bicarb solution is indicated.

Hiccough.—This may be due to irritation of the stomach, liver or the phrenic nerve in some part of its course; it may be due to loss of alkali reserve of the blood, (see hiccough in cholera). Hence the treatment should be according to the cause. Plenty of alkalies, glucose, stomach wash, or alkaline warm drinks to allay the irritation of the stomach, may be of some use. Adrenalin chloride solution orally, three to five drops in an ounce of water, with a drop of acid hydrocyanic dilute, may also be tried. The anti-emetic powders and mixtures may be tried with the hope that if due to gastric irritation these will show effect. A mustard plaster over the epigastrium may have to be given. But in intractable cases nothing but resumption of a normal life may cure this condition.

Anuria.—(1) Plenty of fluids with alkalies and glucose as indicated above.

(2) In cases of low blood pressure, this should be made to rise, so that the optimum pressure for proper filtration of urine is ensured. For this purpose fluids, stimulants to the kidneys and circulation such as subcutaneous injection of caffeine-sodium-benzoate in four to eight grain doses, are among the best. Diuretin orally may be useful. In bad cases pituitary, in suitable doses may do some good. Adrenalin, or cortical extract intramuscularly, concentrated gulcose—say twenty five per cent, a few hundred c.cm. per vein may serve as a useful diuretic. It may have to be repeated every 8-12 hours.

(3) Dry cupping or hot fomentation over the kidney region, specially when dehydration and too low blood-pressure has already been attended to.

(4) The kidneys should not be allowed to get chilled, as this may precipitate an acute nephritis.

(5) Warm rectal saline has been found useful in several bad cases of anuria.

(6) Warmth over the bladder. This may be easily applied even in out of the way places, by filling up a round bottle wrapped with a towel or bed sheet or some such covering.

Anuria of Blackwater fever :—"The anuria of intravascular haemolysis is attributed to injury to the renal epithelium rather than to obstruction of the tubules by haemin crystals."[A] The recommended treatment[B] is the immediate intravenous administration of one litre of isotonic 2 per cent sodium sulphate followed, during the next 24 hours, by fluid administration of three litres in excess of urinary output. There-after fluids should be given strictly in accordance with the demand of fluid loss.

Prevention of Hoemolysis. It is extremely problematic if there is any form of treatment to prevent this condition. Probably the whole process stops by itself. But in very bad cases intramuscular injection into the buttocks of about ten to twenty, c.cm. of a healthy blood-relation's *whole blood* may be tried every twelve to twenty four hours.

Intravenous injection of a few hundred c.cm. of *glucose* in twenty five to fifty per cent solution, or ten per cent glucose solution about hundred to two hundred and fifty c.cm. intramuscularly may be of use. *Extract Casia Beriana* has been found useful by some. Liquid Extract or Tincture of vitex peduncularis (Gluconate) appears useful.

Avitaminosis.—should be properly corrected as soon as possible. For this purpose A and C vitamins[7] appear to be of special use, and may be given by injection or orally. Celin, redoxon, ascorbic acid are some of the common trade names of this pure C vitamin. Liver extracts may be of distinct service, crude liver extract, (T.C.F.) hepatrat, liver extract (*P. & D.*) may prove of some use. Injection of vitamin K may be useful. Adequacy of B complex as liver extract or other injectables should be given.

Extreme anaemia and exhaustion.—The best agent for

A. Medical Annual. 1946, p-57.
B. Maegraith (1945) Lancet. 2. p-58.
7. Krishnan & Pai—paper in the 25th Science Congress. Cal.—1938. (Treatment of Black water fever).

any extreme case is *transfusion of blood* and it may save the patient by tiding[8] him over the crisis.

In myocardial weakness and exhaustion—one of the best things is *glucose with insulin*—given in the same manner as in cases of grave diphtheria. My recent three cases of black-water fever, two of a rather grave type, were treated during the acute stage with glucose and insulin with apparently very satisfactory result. This is given with the idea that proper and ready oxidation and utilization of the glucose under the influence of insulin may prevent the deleterious effect due to loss of alkali reserve, and improper utilisation of glucose. Glucose should be given, orally, by injection, rectally and in as large amounts as possible. It is interesting to find that Naumann (1935) also gives glucose orally and injection of insulin[9].

Hyperpyrexia—should be treated by ice or cool sponging, cold packs, alcohol sponging and so on. The covering of the patient should not be more than a thin sheet.

Calcium.—This in the form of calcium gluconate given per vein in five c.cm. doses of a ten per cent solution, every six to twelve hours may be of use.

Diet.—As the course of the disease is self limited, not uncommonly a short one, nothing but plenty of fluids, alkalies and glucose are required during the acute stage. Fruit juice, specially that of orange, pineapple, batavia or shaddock, pomegranates, grapes, green cocoanut water where available, juice of sugar canes, glucose water with lemon-juice and salt according to taste, may be soothing drinks during the acute or subacute stage of the disease. As the patient's appetite improves, milk and its preparations, such as butter-milk, whey should be added. Gradually, appetising soups and broths thickened with barley or rice or corn-flour, may be allowed. In due time solids are to be added.

Later on tonics, with iron and arsenic and nuxvomcia are of use for quick regaining of health. For this purpose—Easton's syrup, syrup minadex, binin amara, may be of service. A simple prescription like the following is of use.

Tincture ferri perchlor	m.	15
Cal chloride	gr.	10
Dilute hydrochloric acid	m.	15

8. Blackie (1937) Blood transfusion in black-water fever. Lancet—13th Nov. p. 1124.
9. Naumann (1935) Arch. f. Schiffs. u. Tropen hgy. 37. No. 6, p. 299.

Liq. arsenic hydrochlor	m.	2
Tr. Nux vomica	m.	5
Syrup orange	m.	60
Chloroform water upto	oz.	1

one dose twice daily, after meals, in sips through a tube to prevent contact with the teeth.

Constipation should always be avoided, by some suitable aperients or saline purgatives, all throughout the disease, as freely acting bowels ensure diuresis, absorption of medicines and nourishment. For this purpose enemata at the asthenic and purgatives at the sthenic stage may be of service.

Other drugs.—Intramuscular injection of *irradiated ergosterol* has been given to raise the calcium content of the blood. *Cholesterol* in olive oil has also been tried with indifferent result.

Parathyroid, calcium and vitamin D have been given with variable results.

Concentrated glucose per vein is of service by (i) giving fuel and strength to the heart muscle, (ii) increasing coagulability of blood, (iii) preventing easy haemolysis and reducing acidosis, (iv) causing diuresis.

As parasites tend to appear in the circulation during convalescence one should exhibit suitable antimalarials, where indicated.

Prophylaxis etc.—If possible the patient should live out of the endemic zone of malaria. The blood should be examined regularly during the convalescence and when parasites are encountered—mepacrine one tablet after food thrice daily, for five to seven days, should always be given. For sterilising the blood of gametocytes pamaquin is the best drug. Paludrine one tablet of 100 mg once or twice daily may overcome the difficulty of residence in an endemic zone. But the details will be worked out as soon as paludrine is available for general use. Rules of personal prophylaxis should be carefully followed.

CHAPTER XI

LEISHMANIASIS.

(Kala-azar and Oriental Sore)

DIAGNOSIS :—

The clinical manifestations of this infection are varied and numerous. There are (1) The *Indian form of Kala-azar,*

and the infantile form of infection around the Mediterranean,[1] *both showing visceral lesions.* (2) The other forms are the *integumentary forms mostly occuring in north India, and central Asia, Brazil and other parts of South America.* (3) *In case of Kala-azar too,* there is a cutaneous form of affection noted and has been called *dermal leishmanoid.*

The disease is probably transmitted by the insects of sandfly group, kala-azar by a particular type called *phlebotomus argentipes.* Incubation period of kala-azar may extend from *three weeks to three months,* but one has seen incubation period extending up to three years.

Kala-azar.—It is a chronic or less commonly an acute infectious disease, occuring in epidemic or sporadic form, more commonly in the younger people, caused by Leishman Donovan bodies, characterised, usually by, irregular fever, progressive emaciation, weakness, leukopenia, enlarged liver and spleen. The disease is highly fatal in the untreated. There are certain common complications which may prove serious.

Clinically—the fever generally lacks the characteristics of malarial fever and is irregular. About eighty percent will show, in some part of its course, a double rise of temperature, if regular four hourly charts are kept. The following are very suggestive points :—progressive enlargement of the spleen and liver. The spleen is comparatively soft but friable, there is also simultaneous enlargement of the liver. During the earlier period, anaemia is not pronounced as is noted in cases of malaria. The tongue is generally clean, bowels are not so constipated as in malaria, the presence of the desire for food, not uncommonly, a voracious appetite, even at the later stages of the disease, may help to differentiate kala-azar from other clinical conditions simulating it. There is a peculier pigmentation or the high mortality in the untreated, which might have been instrumental in imparting the disease it's name. No response to anti-malarial therapy is also a diagnostic point when confusion aries between this infection and malaria. *Generally the patient's subjective sense of illness is much lesser than the signs and symptoms would suggest.* This is an important point clinically.

Laboratory Findings.—The important ones are, progressive leukopenia, the ratio between white and red blood corpuscles normally is about one to seven hundred and fifty.

1. Giraud (1936) Marseille med; 73. No. 21. p. 81.

but in kala-azar the white blood corpuscles diminish and the red blood corpuscles are not much reduced numerically, hence the ratio comes to one to thousand or even fifteen hundred, in advanced cases. Whereas in malaria this ratio comes to one to four hundred or thereabout. In the *differential count*, the neutrophils are much diminished and there is a relative increase of lymphocytes. An average case of about three months' duration is likely to show something like the following differential count; polymorphonuclears—about forty percent, lymphocytes about forty-five per cent, large mononuclears about thirteen to fifteen percent, eosinophils one to two per cent.

According to Brahmachari—the *globulin opacity* test is important diagnostically.

The *aldehyde test* is usually not positive before the third month hence is not of so much importance in the early stage of the disease.

Chopra's urea-stibamine test is said to be of use diagnostically during the earlier period of the disease.

But by far the most important method diagnostically is the peripheral blood culture in N. N. N. medium incubated at twenty one degree centigrade for ten to fourteen days. The flagellate form of the Leishman Donovan bodies appear in the water of condensation in positive cases. This is diagnostic.

Spleen puncture etc.—This was formerly undertaken rather very frequently, but is not always free from risks. Liver puncture is advocated by Krishnan. Bone (sternum) puncture is also done. Part of the pulp got from the puncture material may be stained, seen under the microscope and the other portion cultured.

In Children.—The symptoms and signs may be atypical and the leukopenia, so characteristic of the disease, may not be pronounced. In one case leukocytosis was encountered at the early uncomplicated stage. The fever may be irregular, pallor and anaemia are more marked in children, of Anglo-Indians and Europeans. Rarely jaundice and prominence of abdominal veins with enlarged liver and spleen may simulate cirrhosis of the liver.

Typhoid like onset of Kala-azar.—These cases may show only the irregular fever, with typical double rise in some part of its course, and diarrhoea. Though this is sometimes mistaken for typhiod fever, yet the toxaemia, clouding of sensorium, the dull look, the coated not uncom-

monly tremulous tongue, tympanites, diarrhoea, slow pulse, and the other characteristic laboratory tests, diagnostic of enteric group of fevers, lack in this condition and thus help in the differentiation. The subject of Kala-azar is generally bright, takes interest in the outer-world. His tongue is as a rule clean, inspite of the diarrhoea, he wants to eat. The tympanites and other abdominal findings are not so pronounced as in typhoid fever. There may be enlarged liver and spleen with a blood picture and other laboratory findings typical of Kala-azar. In all doubt-ful cases culture of the peripheral blood for the flagellate form of the parasites may be of great help. In Kala-azar the spleen may go on enlarging even during the apyrexial period.

Complications are varied and numerous.—The body's resistance is much lowered due to the over crowding of the reticulo-endothelial system of cells by the L. D. bodies. Leukopenia also causes the body to fall an easy victim to all infections. Hence in such cases any infection, however trivial may take an unusually prolonged course. That is why pneumonia in subjects of Kala-azar was a very serious disease and the mortality was much higher than that in healthy controls.[2] Complications following pneumonia are also common. Sulphonamides and penicillin have altered this picture favourably.

Respiratory System.—The commoner complications in this system, in order of their frequency, are bronchopneumonia, pneumonia with their complications, such as delayed resolution, empyema, abscess lung, rarely gangrene and so on.

Gastro-intestinal System.—Dysentery, more commonly bacillary or mixed with amoebic, than the latter alone, have been encountered. Superimposed or concomitant helminthic infection has been described erroneously as a complication. Cirrhosis of the liver and ascites have been described.

Septic.—Cancrum oris, pimples on the skin, itches, susceptibility to suppuration which is difficult to cure, indolent sores and ulcers are not uncommon.

Haemorrhages.—Epistaxis, bleeding from the gums, are the commonest. Sometimes, uterine or intestinal haemorrhage not ascribable to any thing else has been suggested

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2. Dhar (1937) Bearing of enlarged spleen in pneumonias; a paper read at the reunion of the Calcutta Medical College in 1937.

to be due to this condition. In extreme cases one has seen purpuric haemorrhage.

Low blood pressure is quite common with or without a rapid pulse. Agranulocytosis is recently reported[3].

Dermal Leishmanoid.—This condition may simulate leprosy,[4] and other skin diseases. There are generally two modes of onset, either before or after treatment[5] of kala-azar. It is very difficult to treat.

Differentiation—has got to be made from acute and chronic malaria, typhoid group of fevers, tuberculous infection, bacillus coli pyelitis, acute leukaemia, endocarditis, splenic anaemia, Hodgkins disease, leukaemia, cirrhosis of liver, etc.

TREATMENT

Early work.—Some south American workers treated cutaneous Leishmaniasis in Brazil in 1913[6] by the injections of tartaremetic with success. Earlier Italian workers used tartaremetic in the treatment of infection by Leishmania Infantum with good result. In India the earlier pioneer workers in this field were Rogers, Castellani, Muir, Brahmachri, Mackie and others.

Tolerance or Immunity.—We have already seen in the case of malarial infection, that the defensive mechanism of the human system, bettered through repeated bouts of fever, is very important in the untimate cure of that infection. The same holds good in the case of Kala-azar too. So one may wait for a few weeks and allow the fever to continue, thus helping the production of systemic defence, and then exhibit the specific drug. But, as a rule, the subjective feeling of the patient is not troublesome or disabling enough, except in the typhoid like onset, to prompt him to consult a doctor. So when these patients come for medical help several weeks if not months of febrile-period have passed already, enabling the formation of some defence in the system. Hence once the patient comes to the doctor, treatment by the specific remedy, may be started almost immediately in the majority of subjects of kala-azar.

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3. Zia and Forkner (1936) Amer. Jour. Med. Sci. 188: No. 5, p. 624.
4. Smith and Halder (1935) Ind. Med. Gaz. 70: No. 11. p.544.
5. Napier (1935) Ind. Med. Gaz. 70: May. p. 267.
6. Brahmachari (1928) A treatise on Kala-azar; p. 110 John Bale Sons and Danielsson Ltd., London.

Trivalent compounds, Sodium and Potassium antimony tartrate :—

These trivalent salts of antimony with sodium and potossium were the sheet anchors in the treatment of this disease before the discovery of the more potent pentavalent compounds. The trivalent compounds were given intravenously in one to two percent fresh solution, in freshly prepared distilled, preferably redistilled water. The solution either should be autoclaved or sterilised by boiling shortly before use. If two percent solution is used, half a c.cm. and one c.cm. of a one percent solution should be the initial dose. The dosage should be increased by half a c.cm., the interval between injections generally being three to four days, or on an average two injections per week. Care should be exercised to see that no portion of this very irritant fluid leaks outside the vein, if so happens almost surely a sterile abscess will follow. This will be the case specially when the potassium sait is used. In such a case the vein may be blocked to further injections.

For children, smaller doses are indicated and always a one percent solution is better. The dose should also be increased very slowly. Any severe reaction means either repetition of the same dose or even reduction of dosage.

The maximum dose for an adult usually consists in about seven c.cm. of a two per cent and about ten to twelve c.cm. of a one per cent solution. The potassium salt is found to be more toxic than the sodium salt.

Reactions and toxic symptoms.—Febrile reactions are quite common following these injections, and should not be seriously taken unless very excessive. Nausea, vomiting, headache, pain in the chest following injections, usually indicate a reduction in dose.

When the fever of kala-azar comes down to normal and does not rise again, except due to reaction, about 2.5 to 3 g. of the salt per hundred pounds of body weight may prove adequate. Generally in the case of an average adult three to four grams of the salt, and not the number of injections, are the criteria for adequate dosage.

Those, who do not show much favourable and expected result after the injection of sodium, are given the more toxic potassium salt. Not uncommonly only a few such injections improve the case so favourably that again one can revert to injections of the sodium preparation.

The same criteria for cure, as discussed under the pentavalent compounds should hold good here too.

Pentavalent antimony compounds :—

Urea stibamine (*Brachmachari*) is a very potent remedy against all forms of kala-azar, and is a triumph of modern chemotherapy. It is not only useful in the treatment of all forms of kala-azar but also causes the least of relapses after therapy. Form personal experience I have found lesser number of relapses after treatment by urea-stibamine than after the use of neo-stibosan, a German product now not available though very highly spoken, of by the former kala-azar worker in the School of Tropical Medicine Calcutta.

Dosage etc. Urea stibamine is available in 0.01, 0.025, 0.05, 0.1, 0.15, and 0.2 g doses in separate cartons to be dissolved in ½, ½, 1, 2, 2.5 and 3 ccs respectively of freshly prepared distilled water. The solution should always be made fresh and on no account be boiled, as old solution and boliing make them toxic.

For adults one can start from 0.05 g increasing by 0.05 g twice a week reaching upto 0.2 g till a total dose of about 2.4 g is given. These should be given regularly without cessation till the above total dosage is reached in an average Indian adult., For more bulky persons above ten stones the total dosage need reach near three grams.

For Children one should commence with the smaller initial doses near about 0.025 g for children of about five years and 0.01 g for infants to be increased by corresponding proportions only the total dosage should be about 1.5 g or lesser in infants.

A few practical points :—About 2 hours previous to these injections if the patient is made to drink a cup of milk with sugar or made to take a powder containing ten grains each of potassium citrate, sodium bicarbonate and calcium lactate any possible risk of liver damage is lessened. Unless the patient has an empty stomach these intravenous injections may cause vomiting . In a few cases with intolerance of anaphylaxis like phenamena following injections of urea-stibamine were relieved and their tolerance improved when these injections were preccded by an antiallergic mixture with ephedrine given on page 11. *This is a very important practical point in intolerance to urea-stibamine.*

Intensive Course.—Brahmachari(1933)[7] has suggested an intensive course by urea-stibamine. This consists in giving an initial small dose and testing the tolerance of the patient by examination of the urine and watching for any untoward symptom. Then daily intravenous injection of 0.1 to 0.2 gram of urea-stibamine till ten or more such injections, with a total of two grams or more of the salt, are given to an average adult. The contents of an ampoule are poured in five to ten c.cm. of sterile redistilled water in order to dissolve.

In younger subjects a modified intensive course appears safer to the writer. One uses the above method in two courses, each of five daily injections, the dose varying directly according to the body-weight, with five to seven days gap in between each course. This allows, some time for the excretion of the rather innocuous salt.

Reaction etc.—Reaction and untoward symptoms are though comparatively rare, yet one has seen urticaria, vomiting, difficulty in breathing, headache following these injections. But none has been so far fatal in my hands. One case of fatality however has been reported[8]. These are treated by injection of atropine, adrenalin and calcium in proper doses.

There are many similar preparations in the Calcutta market about which one can not speak anything from experience. But they are expected to be good.

Neostibosan (German product).—It is an improvement on stibosan. According to Napier (1927)[9] of the School of Tropical Medicine, Calcutta, this was the most effective and least toxic of the pentavalent antimony compounds, not available now a days.

Stilbamidine though is said to be an advance[10] in the treatment of Kala-azar, yet the immediate reaction sometimes bad enough requiring the injections of adrenalin to counteract and the late neuropathic disturbance, specially paraesthesia and anaesthesia over parts of supply of the trigeminal nerve sometimes appearing three to four months after treat-

7. Tran. Roy Soc. of Tropi. Med. and Hyg. 1933 January 31, p. 389.
8. Nag. (1937) Ind. Med. Gaz. May 1937. p. 298.
9. Napier (1937) Kala-azar—Milford—Publication.
10. Somers (1944) Lancet I. p-531.

ment,[11] are the main draw-backs standing on the way of its universal usage. It is said to be useful in resistant cases and relapses, and the percentage of cure in average cases of Kala-azar is near about 98 per cent. It is injected intravenously very slowly at the interval of one to three days. the the initial dose being 1.1 mg per kilo of body weight, to be increased gradually to 3.5 to 4 mg per kilo. The total dosage is about 300 to 500 mg for adults mainly according to body weight.

Kala-azar and Pulmonary tuberculosis once known to be a fatal combination, is recently being successfully treated by stilbamidine for the former state, without deterioration of the lung affection. Sengupta gave intravenously on alternate days stilbamidine till a total dosage at the ratio of 0.89 gm of the remedy per 100 pound body weight were given. His patient weighting 76 pounds received total of 0.675 gm of stilbamidine[12].

Intramuscular injections.—

In infants. oedematous, or flabby persons or in whom the veins are not visible or suitable or where intravenous injection is contraindicated these are the preparations of choice.

Neostibene (*Brahmachari*) is para-aminophenylstibinic acid in organic combination, the packings are 0.01, 0.025, 0.05, 0.10 and 0.15 g with stibosolvent in each carton, for intramuscular injection which are more or less painless or cause little pain.

Dosage etc.—is some-what like that of urea-stibamine and in urgent cases the injections may be given intramuscularly in the alternate glutei every other day. Careful massage and fomentation of part injected may not cause pain. It is not very safe to give these injections anywhere else except in the glutei or in the outer surface of the thighs. From experience we have found neostibene to be an effective and quite useful preparation with potent therapeutic properties.

Anthiomaline (*May and Baker*) lithium antimony thiomalate "is a trivalent organic compound containing 16 per cent of antimony designed for intramuscular injection in treatment" of leishmaniasis etc. Supplied in boxes of ten 2 c.c. ampoules containing a six per cent solution; course

11. Napier and Sengupta (1943) Ind. Med. Gaz. 78 p-537.
12. Sengupta (1944 Feb) Ind. Med. Gaz. 79 p-33

started with 0.5 c.c. to be increased by 0.5 c.c. intramuscularly till 2 c.c. is reached in an adult. The average course is about 20 injections. In some refractory cases the last few doses may reach upto 3-4 c.c. each. Children should get it according to body weight and are said to tolerate the drug well. We cannot say much about its usefulness because we tried this preparation only in a few cases.

Stibatin (Glaxo) pentavalent antimony gluconate, supplied in bottles of 30 c.c. containing 20 mg per c.c. Daily dose of intramuscular injection is 15 to 20 c.c. usually for ten days till a total dose of 150 to 200 c.c. are reached in an adult.

Though the individual doses are quite big, the efficacy has not proved very satisfactory, as a few cases relapsed after treatment in our series so also is reported by Sengupta et al[13]. Recently a concentrated preparation has been introduced, about which we cannot speak from experience yet, but it is expected to be satisfactory.

Solustibosan :—May be used as a concentrated watery solution 1 c.c. representing 0.1 g of pentavalent antimony whilist the oily suspension contains 0.054 g per c.c. The watery solution is given daily intramuscularly for ten days the total dose being 1 c.c. per kilo of body weight thus 10 c.c. sufficing for a patient of ten kilo weight. The oily suspension is said to be better, and the injections are given intramuscularly on alternate days till a total of 2 c.c. per kilo of body weight is reached. They are nontoxic. Some of the cases so treated were not fully cured though.[14]

Stibanate (Gluconate Ltd) is also an useful preparation for intramuscular use.

One should bear in mind that it is not the number of injections but are total quantity of the salt in grams that is important in treating cases of kala-azar. The dosage is generally based on the body weight.

Contra-indications.—Nephritis and ascites are, as a rule, contraindications to the use of all antimony compounds in general, except in those cases where the ascites may be due to the doubtful effects of kala-azar. Pneumonia and jaundice demand suspension of the treatment at least for the time being. But in cases of suspected cirrhosis of the liver the drug should be with-held. Whenever there is any remote

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13. Sen Gupta and Chakravarty (Nov 1946) Ind. Med. Gaz. p. 468.
14. Bermudez (1943) Med. esp. 56 p. 301.

possibility of any liver damage, the remedy is to be given after flagellate culture from the blood has proved positive. Otherwise antimony salts may damage the liver further. Tuberculous subjects get worse on antimony treatment. But stilbamidine is safe and useful.[12]

Relapses.—With sufficiency of dosage of pentavalent compounds relapses are lesser than was the case with trivalent salts. But the adequacy of the salt in grams is the important point, and not the number of injections, as already emphasised.

Resistant cases.—Resistant cases should be treated by a combination of drugs. In bad cases pentavalent compounds of various types might not only have to be alternated with each other, but also a few injections of the trivalent salts, even of the potassium antimony tartrate, may have to be tried. *Stilbamidine may be of special value in these cases.* But fortunately such cases are rare, specially when the initial treatment has been adequate. Personally one has seen only one such case. They are very difficult to treat.

The signs and symptoms of a possible cure.

Clinically.—The patient gains in weight, his subjective symptoms improve, he feels better, the temperature subsides and remains normal. The spleen gradually recedes and ultimately becomes impalpable, in early or uncomplicated cases. An unusually big spleen may not become normal in six months or longer after treatment.

Laboratory tests of a cure.—The total white blood count increases, the neutrophil polynuclears become increased proportionally. A leukocytosis being of good prognostic significance. The aldehyde test generally becomes negative. But the most important criterion of a cure is in a negative cultural result of peripheral blood and material derived from spleen and sternal puncture.

Ancillary Treatment. The pentavalent compounds produce so striking a cure that practically very little is left to be dealt with, under this heading.

Some irritants were used formerly to produce sterile abscesses for the purpose of producing leukocytosis, with not very encouraging results.

The preparations used are T.C.C.O. (Turpentine, camphor, creosote in olive oil) in half to one c.cm. doses intramuscularly into the buttocks. It is extremely painful and in private practice the patient may not see the doctor again due to the intolerable pain following these injections. Muir

was an warm advocate of this remedy and method of therapy. *Sodium nucleinate* in suitable doses may be tried. Commonly used strength is, three c.cm. of a four or five per cent solution subcutaneously or intramuscularly, daily or on alternate days, till six to twelve are given. It causes slight leukocytosis in some cases.

Iodine Solution.—intravenously—twice a week, one to two c.cm. on alternate days or every third or fourth day, may be tried.

Arsenicals.—organic arsenicals such as soamin, sodium cacodylate—in two or three grain doses, six to eight such, intramuscularly have been tried with doubtful result.

Vaccines.—In varying doses may be of use too, notably in the presence of sepsis anywhere. They may help in producing some leukocytosis.

Enlarged spleen.—Some of the less irritating of the above mentioned ancillary remedies, when alternated with each other, may help in slight reduction of the size of a spleen, not much reduced even after adequate treatment by antimony preparations. Sometimes hydragogue saline purgatives given regularly on alternate mornings, or the tonic anti-malarial mixture with magnesium sulphate, mentioned in the treatment of chronic malaria, when taken for a long time, may help in reducing the size of the spleen.

Change of place.—Change to a more dry bracing climate does not bring about much improvement in the untreated. But once adequately treated, these patients sometime improve their health remarkably through a change to a non-endemic better climate.

Treatment of Complications. To understand the basic idea guiding the treatment of the complications, one should realise that the lowered resistance of the system of the patient, due to lack of proper leukocytic response, as a result of out-crowding of the reticulo-endothelial system by the parasites of kala-azar, prepares the ground for all sorts of infections which the normal person might successfully resist. Hence along with treatment of the superimposed complication, the mother disease, namely kala-azar, which has paved the way, to such an infection, needs judicious and careful treatment. In such cases as soon as the urgency of the superimposed infection is less, small, safely tolerated doses of the specific pentavalent antimony compound, should be given at suitable intervals, better intramuscularly or intravenously if safe.

Dysentery. When due to bacillary infection, as is in most cases or in mixed types of infection, one should give alkalies and sulphaguanidine. Along with it, as soon as the acuteness subsides, pentavalent antimony group of drugs may have to be given cautiously and at longer intervals and in smaller doses to strike at the root of the mother disease, which helped and made possible the very grafting of the dysentery, on a body of lowered resistance.

Pneumonia. If the patient survives an attack of pneumonia, due to the stress of the infection, a leukocytosis, may, by itself favourably influence the mother disease, kala-azar. But generally the leukopenia does not improve even under pneumonia. As soon as the toxic bacterial burden is over and the patient's condition permits, it is better that the kala-azar should be cautiously treated. After an attack of pneumonia unless the mother disease is adequately treated there is a constant risk of the recurrence of the pneumonia next winter with even fatal result. Such an outcome is not uncommon in the experience of those, who do much rural practice in kala-azar affected areas. This point is of considerable importance, in view of the ultimate safety of the patient. In these cases of pneumonia, on subjects of kala-azar, there is a comparative greater incidence of delayed resolution, empyema, abscess or gangrene of the lung as compared with control healthy sufferers from this acute infection. *Penicillin and sulphadrugs have changed the outlook for the better in these complications.*

In one of the bad cases of empyema in a boy of ten years, the condition of the patient was too bad for surgical interference, but repeated aspiration of the pus and neostibosan intravenously gave him strength to successfully undergo the resection of the rib with ultimate recovery. In cases with marked leukopenia penicillin therapy is indicated in all inflammatory conditions, complicating Kala-azar.

Septic complications.—The most serious amongst these is *cancrum-oris*, which is often the terminal event in cases of kala-azar. In them, the local treatment, is of as much importance as the systemic one caused by the Leishmania Donovani. The local application of one part of trichlor-acetic acid in eight parts of glycerine, soaked in cotton and kept in contact with septic area, to be changed every twelve hours, may help in the separation of the slough. The affected part may be kept in contact with cotton-wool moistened with *colloidal silver*, or *weak lysol solution*. Local irrigation

and gargling *by electrolytic chlorine, permanganate solution acriflavine etc., may be* of some benefit. *Autogenous vaccines* are worth trying. As a rule, there is anaemia of a severe degree in these subjects and to combat that successfully would be an important item in the treatment. For this— liberal doses *of iron—say dram* doses of *ferri et ammoni citratis*—and twenty minims to half a dram of *dilute hydrochloric acid, thrice* daily after food, may be of use. Injections of *liver extract* in suitable doses, daily or on alternate days, till twelve to eighteen such are given may materially improve matters. Good *vitaminous diet* rich in proteins may help in building up resistance. Arsenic in small doses is useful. Nuxvomica, Easton's syrup etc., may serve as useful tonics in all these complications. *The kala-azar should also be treated intensively.*

Penicillin in Cancrum-Oris.[15]

Recently local application of a solution containing 500 *units per cc. of penicillin for about a fortnight and intravenously* ten thousand units every three hourly for six days or longer and daily one injection of urea stibamine till the optimum dose for age and body weight were completed gave satisfactory results in cancrum-oris. The slough separated in 2 to 3 days time in most cases. Wherever possible this should be the therapy of choice in this serious complication of K.A.

Pimples and itches,— all over the body, are quite common and require suitable management. Otitis media, mastoid or deep-seated abscesses should be treated on the above principles by sulpha-drugs and penicillin. A leukocytosis in all these complications is of a good significance.

Haemorrhagic.—Epistaxis, bleeding from gums, uterus etc., should be treated by injections of calcium, whole blood in ten c.cm. or more, sodium citrate per vein in five to ten c.cm. doses of a ten percent solution. Horse serum, haemoplastic sera, tissue extracts etc., are of service too. Transfusion of compatible blood may save the patient.

Locally strong alum lotion, adrephine solution, viper venom, venomstat, oil turpentine, thrombin topical (P & D) liquor ferri perchlor etc., may serve useful purpose by checking the haemorrhage. For all haemorrhagic states plenty

15. Sen Gupta and Chakravarty (1945. Nov) Ind. Med. Gaz., P. 542.

of vitamin and K are of use. To prevent infectious processes to spread A, and for proper calcium metabolism and other purposes D, and C vitamins also should be exhibited in adequate proportions.

Anaemia. For the anaemia big doses of iron combined with suitable amount of dilute hydrochloric acid and pepsin, are generally all that is required. Liver extract injection may also be useful. Plenty of fruit juice is helpful.

Children.—Children may show atypical manifestations, and as often their veins are not visible, neostibene may have to be given intramuscularly as discussed and indicated already.

Dermal Leishmanoid.—Out of the two types of this condition—that one which occurs before treatment of kala-azar is generally amenable to large doses of the penavalent antimony compound and potassium iodide. But the variety which follows treatment of a case of kala-azar, is extremely intractable and is very difficult indeed to treat. But the lines of treatment are the same in both. Two to three courses of pentavalent antimony compound at an interval of a few weeks, and potassium iodide in big doses may help in improving the condition slightly or considerably. Other leukocytosis producing agents and injections of irritants into the buttocks may also be tried. Vaccines got (Leishmo-dermin) from the culture of these parasites may be tried in all these cases, particularly for the production of leukocytosis, if not for the specific purpose. Penicillin injections may be tried.

ORIENTAL SORE

(Dermal Leishmaniasis)

It is prevalent in the Punjab and North Western Frontier Province in India and also common in South-West of Asia including Arabia, Palestine and Northern countries of Africa and other places. The infection appears to be spread by sandfly.[1,2]

Diagnosis. The lesions are principally noted on the exposed parts of the body. They generally commence as papules, which break down, and the margin of these ulcers are generally raised and indurated. The parasites are encountered in the margins and deep in the floor of the ulcers.

1. Wenyon (1928) Brit. Med. Jour. ii, p. 558.
2. Shortt, Sinton, Swaminath—(1935) Ind. Jour. Med. Research 1923 July p. 279.

The sores vary widely and may show from non-ulcreated papules or warty growths to large indolent looking ulcers with hard margins. The sure diagnosis is made only by finding the parasites in the material aspirated from the floor or margin of the ulcer, or by culture of the materials in N.N.N. medium, and thus finding the typical flagellate forms of the parasites.

TREATMENT

Antimony Salts.—Sodium or potassium tartrate or other pentavalent compounds of antimony as used in cases of kala-azar may be given. The result though variable is always worth trying.

Emetine hydrochloride.—Upto twenty minims of a five per cent solution of emetine, may be infiltrated round the edges and floors of the ulcers.

Berberine Sulphate.—Warma (1934)[3] in addition to intravenous antimony medication, used berberine sulphate in one fourth grain doses in one c.cm. of sterile solution—as a local injection, close to the margin of the sore. They are repeated weekly, till two or three such injections are given and are said to effect a cure.

Vaccine from culture of L. Tropica.—Row and Ray's[4] (1936) vaccine 0.5 to 1. c.cm. doses subcutaneously twice a week upto seven such are used. Ray's vaccine[5] (Leishmodermin) was also favourably reported sometimes back. The results are promising and are worth a trial. Multiple ulcers were cured in several instances by these injections. Recently Lawrow[6] (1937) and his co-worker have produced immunity (tolerance) by injection of cultures.

Dithranol (B.P.) or *Cignolin.*—Recently Manson-Bahr[7] (1987) reports favourable results from the application of dithranol (B.P.) or cignolin paint to the sores daily for a period of fourteen days or more.

Ointment from Ricinus seeds.[8]—An ointment is made of these seeds, in ten per cent of vaseline, and is applied to the

3. Ind. Med. Gaz. (1934) 69: Nov. p. 616.
4. Medical Annual—(1936). p. 329.
5. Thomson (1930) Proc. of Roy. Soc. of Med. 24: 1, p. 499.
6. Lawrow and Dubowspoj (1937) Arch. f. Schiffs u. Tropen hyg. 41. No. 4. p. 874.
7. Medical Annual—(1937) p. 267.
8. Kassirsky (1935) Med. Parasis and Parasitic Dis. (Moscow) 4: No.—1-2; p. 67.

ulcer every few days. The first application causes much irritation and a copious discharge of pus. Healing is said to start after the third or fourth application.

Penicillin.—Locally and by injections should be tried.

CHAPTER XII.

TYPHOID FEVER

Diagnosis.—Diagnosis has to be made from clinical features and by laboratory aids. First the clinical points are stressed.

There are so many variations from the usual in this disease specially in children that diagnosis simply on clinical data may not be possible.[1] The fever often characteristic in type, may show much atypical variations. Only one can stress on some general and frequently met facts which may be of some use diagnostically. There are other diseases which simulate typhoid fever, more frequently, than it simulates them. Any fever lasting for more than seven days unless proved otherwise should be suspected to be of typhoid group of infections. Coexistence of other associated diseases may make the diagnosis still more difficult.[2]

Onset.—The onset is usually gradual, after an incubation period of generally ten to fifteen days. *General malaise, headache, anorexia, constipation may be common at the onset.* Gradually the dull look of the patient begins to show itself, making the name typhus, meaning a "cloud" truely significant. The characteristic heavy and dull appearance not only shades the bright normal physical appearance of the patient but also his sensorium is clouded over too in the majority of cases. The fever gradually rises more or less in a step ladder like manner to be somewhat constant by the tenth day or there about. There may be bronchitis of which the patient does not complain much. Epistaxis may be common at onset, but it may be a common symptom in hypertension., diphtheria, kala-azar, epidemic-dropsy, blood diseases and in some other conditions as well. The pulse is usually slower in comparison with the temperature during the first few days and may show dicrotism from the second day onwards, this disappears by the seventh day or later. The tongue may be tremulous and coated with white fur at

1. Hurez (1935) These de Paris—1935—No. 551.
2. Perez-Medina (1935) Ibid. 1935. No. 101.

the centre with a red margin and tip. A palpable and soft spleen may be found. But the spleen may be palpable in all acute infections. Diarrhoea, tympanites, distension come usually by the middle of second week or later. Early there may be gurgling in the caecal region but this is not characteristic of typhoid fever alone. Rose-spots are not so common in Indians, but is not uncommon amongst the white patients--best seen on the abdomen and the trunk.

In a severe attack, the abdominal distension, diarrhoea, usually associated with insomnia, delirum, stupor, subsultus-tendinum, carphology, coma-vigil etc., are generally the manifestations of a protracted fight of the system with virulent bacteria and their toxin.

Catarrhal symptoms such as coryza, conjunctivitis, flushed face, high initial temperature with quick pulse rate, are more or less against the diagnosis of typhoid fever. Though no age is exempt—yet it is more common in India among the young and young adults, usually between 10 to 19 years.

Laboratory findings.—Leukopenia is highly suggestive, and a definite leukocytosis is more or less against the diagnosis of an uncomplicated enteric fever. In the differential count there is diminution of polymorphonuclear neutrophils and eosinophil corpuscles, but the mononuclear elements are relatively increased.

Blood culture.—When properly done it is positive in most cases during the first week and less successfully upto the tenth day or there about. Recently a case[3] is reported where culture of bile was positive, Widal reaction and blood culture proving negative.

Culture of Stools.—Fresh stools generally show the Eberthella typhi--organism, from the second week and almost to the end, in some cases. *Urine Culture*—This may show the bacilli by the third week or later on.

Gruber-Widal reaction.—Specific agglutination phenomenon seldom appears before seventh or eigth day and when persistently positive or shows positive reaction in gradually ascending dilutions, and when the clinical symptoms warrant a diagnosis of typhoid fever is most likely. H agglutinin is *specific, and O. agglutinin is a group reaction. But the question* of recent prophylactic inoculation against typhoid infection should be out-ruled before this is seriously accepted.

3. Castellanos and others (1936) Arch. de. Med. inf. Havana V. 376.

With proper technic a positive reaction of one in hundred of O agglutinin is highly suggestive of this infection.

Marris's atropine test.—This test is not always dependable and gives doubtful results in toxic patients and elderly subjects.

The diazo-reaction.—It may be helpful, when the clinical symptoms are in favour. But a positive reaction is got in measles, typhus fever, pneumonia, tuberculosis and erysipelas.

Commoner Complications,—early or late are : haemorrhage, perforation, parotitis, thrombosis of the veins, most commonly of the left iliac due to its peculiar anatomical position, cholecystitis, abscesses of the skin, pneumonia,—hypostatic or infective. Bed sore though common, is more due to improper nursing, inanition, and low plasma-protein in blood, than due to anything else. Hyperpyrexia, recrudescence and relapse may occur.

Differentiation. however has got to be made from remittent type of malaria, acute kala-azar, tuberculosis, sepsis and other fevers of continued type.

TREATMENT

Prophylaxis.—There may be no definite certaintly about the life of a person infected by Eberthella typhi, but those persons who are not yet affected may however always be protected by *inoculation* of a typhoid and para A and B vaccine[4], in suitable doses, according to the age, weight, sex etc., of the subject to be protected and by keeping him off the risks of infection. Two such preventive inoculations at the interval of a week to ten days often confer sufficient immunity either to abort the disease, or show only milder manifestations even when attacked. But persons in the incubation period should not be inoculated. Strict care should always be observed to see that the infective materials, such as stool, urine, soiled linen before being washed properly away from sources of drinking water, are disinfected. The stools should be made to come in contact with sufficient active bleaching powder for at least two to three hours. Hard faeces should be liquified to bring the disinfectants in intimate contact.

If properly used bleaching powder when fresh, may be used for disinfection of stool, urine, clothing etc. Corrosive sublimate one in 500 lotion may be used with advantage also.

4. Castellani (1936) Policlinico 1936; 43; 1537.

Specifics.—In the absence of any specific remedies in this serious infection, *streptomycin* should be given a full trial from the very early stage of this infection, because when given late it is not of any use. (see page 66 on streptomycin chapter 7.)

Organic Tin Compound.—Patel[5] of Bombay reported favourably on the use of an *organic compound of tin* named "Aldestan" manufactured in Palestine. Five tablets daily to an adult with potassium-iodide for *twelve days* is the course. Children should get smaller doses. But the results are not very convincing. Those interested should read the report.

General Measures :—

For details of Rooms, bed, rest, nursing etc. see chapter no Fever page 12 onwards.

Any symptoms suggestive of haemorrhage or perforation should prompt the attendants to inform the doctor immediately. .

Mouth.—For details see page 20. A cotton swab dipped in alkaline antiseptic lotion serves this purpase of cleansing very well. Ulcers or denudation of the epithelium of the buccal mucosa should be touched either with tincture iodine or four per cent mercurochrome solution. Any hard crust formed around the nostril or the mouth may be softened either with boro-vaseline or liquid paraffin and gradually removed. As a preventive against parotitis the patient's tongue should be touched twice daily with a swab dipped in clove oil or some such irritant or sour material or chewing gum which causes flow of saliva.

Skin.—For details see page 16 to 18.

The bed sores are very troublesome, and are best prevented by careful nursing. After the patient has passed urine or faeces he should be cleaned immediately, first by wet sponging, dried, then dusted liberally with some good dusting powder with a large percentage of zinc-oxide in it. Special care being taken for the scortum or vluva and the natal cleft. A regular and routine use of alum water made by putting a block of alum for a few minutes in bath water before the regular morning and evening sponging, often prevents the easy development of bed-sores. The skin at the pressure points should be hardened by four hourly application of methylated spirit followed by the inunction of an ointment containing one dram each of zinc oxide, boric acid and tinc-

5. Patel (1946, Sept) Ind. Physician. 5. p. 209-215.

ture benzoin compound per ounce of white vaseline. As most of these serious cases of enteric fever remain unconscious during the fastigium, the attendants or the nurse should try to follow the above routine and always keep a watchful eye to change the solied linen and do the suggested toilet without the patient having asked for them. An air cushion or air rings may spare the pressure points from bed sore. Air or water beds are not generally required. Low plasma-protein content conduce to formation of bed sores hence the importance of suitable diet specially rich in animal pretein such as milk and its preparations, protein hydrolysates predigested milk-casein etc.

The patients of elderly or of a weak heart, *should be changed from side to side from the usual dorsal decubitus,* and the position maintained by suitable support of pillows. Morning and evening sponging should be started with tepid water. If there is a higher temperature than 102.5°F, the water for sponging should be gradually cooled down till just cool to the touch and this should be used to finish the terminal part of sponging, lasting about fifteen minutes or more. *Friction,* which tends to raise the blood pressue, is a very important item in the bath treatment. Voluntary effort or any exertion during bath is detrimental. The feet of the enteric patient, may have to be kept supported as foot drop may take place in prolonged fever.

Retention of Urine.—In the unconscious or weak feeble patients this may cause much restlessness, best relieved either by hot fomentation or an enema. If these fail a soft rubber catheter may be used with all aseptic precautions. Tincture belladonnae in five to seven drops and warm rectal saline or enema may obviate the necessity of catheterisation.

In addition to details in the examination of the fever charts, stool and urine, one should scrutinise to ascertain the degree of meteorism, distension of the bladder or other complications. It should also be kept in mind that there may come such complications as venous thrombosis, cardiac failure, hemorrhage, perforation and many others.

Diet.—During the height of the fever the patieint does not like to take any food except liquids. Glucose water, butter milk, fruit juice, drinks sweetened by lactose, may be given in four to eight ounces every two to three hours. Though the usual requirement of about 3000 calories for an average young adult during the febrile stage can not be kept up here, yet for all practical purposes if given only *plenty of liquids* at the height of the fever even with extreme loss of

appetite, the patients do well. But during the early or later stages with some desire for food yet left, besides milk and sweetened with glucose, one can easily give boiled smashed potatoes, with half-boiled egg or milk, or broth or soups. Boild soft rice with milk and egg in the form of a pudding is a very palatable form of diet liked by most young patients. About four ounces of milk, better skimmed, diluted with two more ounces of either barley water or gruel, may be given every two hourly. In cases of *diarrhoea* the stool is generally acid to litmus, and is due to too much of sugar in the diet, and this indicates with-holding specially of sugars and carbohydrates. Substitution of these by albumin water or vegetable soup or simple plain water, alum-whey, Mellin's food, for about twelve to twenty-four hours or so, may improve meteorism and diarrhoea. "The introduction of the full diet in the therapeutics of typhoid fever is the greatest contribution of all time toward the control of the malady."[6] In the past the morbid and unwarranted fear of haemorrhage and perforation etc., made doctors, stick to a low dietary causing inanition and exhaustion—which in their turn instead of preventing the intestinal complications tended to make them more frequent. Amongst the commoner articles of diet which may be given to a patient of typhoid fever who has some appetite left are—boiled fish, soft bolied or poached egg, boiled rice, fruit juice, milk preparations, soft bread and butter, cream and soups, but the latter two articles may induce diarrhoea hence should not be given to cases with loose bowels. Lactose and glucose which are monosaccharides are better than cane sugar. Lactose causes least intestinal fermentation, but too much should not be given. Care should be taken to see that too much diet is not given, as this may conduce to diarrhoea. Carbohydrates are protein sparers and should be blended suitably with other articles of diet, or given alone. A variety in the diet is also of importance. As the appetite improves the quantity and quality of food should be increased. Fever need not necessarily stand in the way of giving a liberal diet, provided, there is an appetite and liking for it. But this should be pushed short of inducing diarrhoea or indigestion. *Vitamin rich diet* should always be aimed at, specially in view of the prolonged illness. Also consuit chapter on fever p. 11.

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6. Beckman (1930) Treatment in general practice. p. 256. (Saunders Publication).

Aminoacids and resistance[7].—Recently Cannon[8] and his associates have demonstrated an increased susceptibility to intercurrent infections in hypoproteinemic patients. In experimental animals also lack of suitable aminoacids in blood prevents optimum rise of agglutinin and other antibody titer. Hence in our typhoid patients with prolonged pyrexia and under nourishment do well under proper protein hydrolysate therapy.

We have used pronutrin of Herts Pharmaceuticals in 2 teaspoonful doses with flavoured soup or fruit juice 4 to 6 times a day, through the intranasal Ryles tube in unconscious patients, coupled with proper hydration with satisfactory results. Bed sores[9] now known to be due also to hypoproteinaemia also improves convalescence is shorter and the patient recovers quickly[10]. Pronutrin is a casein hydrolysate. Injections when available and safe may be more useful

Solid diet. There is the customary plan of giving solid food after the patient's fever remains normal for three days. But this need not necessarily be the criterion in every case. The appetite, assimilatory and digestive capacity of the individual should be our main guides. Soft boiled eggs, boiled fish, bread and butter, puddings, milk preparations. potatoes, cream, cold jellys, ice-cream, soft boiled rice may be allowed in those cases with unimpaired digestion. Meat is not a siutable diet for these patients, specially if there is much fever.

Except in very weak and exhausted or unconscious patients alcohol is better withheld altogether. Those few patients used to alcohol may be allowed alcohol in dram to two drams every three hourly or so.

Toxaemia.—This is best combated by hydrotherapy internal and external. There may be highly toxic cases of typhoid fever in the late second to even the end of fouorth or fifth week and the best means to combat this lie in giving about eight to ten pints of cold water orally, saline subcutaneously and in rare suitable cases rectally, *so that enough*

7. Editorial (1946. Nov. 30.) Jour. Am. Med. Ass. 132 p. 788.
8. Cannon (1942 June) Jour. Immunol. 44 p. 107.
9. Wissler, Wool-ridge et al (1946 March) Ibid. 52 p.267.
10. Mulholand et al. (1943) Ann. Sur. 48. p. 1015.

urine, of about fifty ounces or more are passed. Rectal saline of the following formula :—

Glucose powder	oz.	1
Sodium Bicarbonate	gr.	60
Normal saline	pint.	1

in four to six ounces may be used every three hourly for an adult. *But rectal salines are not generally suitable for typhoid cases,* as this may start the hitherto absent diarrhoea, causing considerable disturbance to the patient. Hence it should never be advised unless very urgently required and that after due consideration.

Subcutaneously Saline.—One pint of saline given in the subcutaneous tissues, every eight to twelve hours is generally very painful—and may result in subsequent suppuration. But it is recommended on the ground that it combats the toxaemia, thus may be instrumental in saving the life of the patient. So subsequent formation of abscesses is the lesser of the two evils.

One can add with advantage about two ounces of glucose to the saline and sterilise it properly before injection. Glucose saline is more useful than simple saline.

Fluids Orally.—By far the ideal method of giving enough fluid is to offer the patient about four to eight ounces of water every half an-hour or so, besides the liquid given along with the feeds. Plenty of green cocoanut water drinks where available may be to the liking of the patient. Intranasal Ryles tube is very suitable. see p. 17.

Delirium. The term is derived from the latin derivative de-lira, a furrow, meaning that the patient's mental processes have become deviated or de-furrowed form the straight and narrow path of sanity.[11] As a rule delirium is mainly due to intense toxaemia and hence all measures to reduce the latter should be adopted as suggested above. Generally it is more marked at night and not uncommonly only muttering in character—though it may be of a violent type, specially, in very toxic cases or in those who are in the habit of drinking alcohol. Such a violently delirious patient may cause injury to himself when left alone, hence an attendant should always watch him. A large draw-sheet may well be utilised for restraint by drawing it over

11. Purves-Stewart (1937) Diagnosis of Nervous diseases. Eighth edition p. 111. Edward Arnold Pubilication.

the body of the patient and having kept folded into the sides of the bed. In all cases ice-cap on the head may be tried. If possible, oral administration of one to two drams of paraldehyde, or ten to fifteen grains each of chloral hydrate and bromide may be given every six hourly. In patients who won't drink any medicine, double the dose of the above sedatives may be given high up rectally with some effect. Intramuscular injection of 5 to 10 c.c. of paraldehyde in bad delirium may induce sleep.

Bath Sponging etc.—Cold sponging, cold bath are very useful in toxic cases. Bath treatment, though not convenient for private practice yet should be taken resort to wherever possible. The beneficial effects of these are varied and numerous. Ice cradle, is a device, like that of an electric bath, from the rods of which are hung about half a dozen of either ice-bags or small flannel covered buckets full of ice. The bags or the buckets are covered either by felt or flannel to prevent the water of condensation soaking the bed clothes of the patient. The whole ice-cradle and the patient are covered by one or two thick blankets to prevent the cold from radiation. The patient is to be covered only by a thin sheet, and his temperature taken every half an hour— and the feet and leg covered by blanket and kept warm by hot water bags or bottles. The cradle is kept in position till the temperature comes down upto 101 to 102°F. Chill felt by the patient is often disregarded and may be salutary in function. Cold packs are also of use.

Cardio-vasomotor weakness.—

At the height of the illness, with toxaemia and high temperature, there is usually some degree of cardio-vasomotor weakness. For this cool sponging, or cold bath with continued friction and prolonged contact of the skin with cool water is of service and helps by raising the blood pressure. Digitails group of drugs appear not of much use here. Coramine, cardiazol, veritol in suitable doses may be tried every six hourly. A useful combination is the following, given intramuscularly every four to six hourly;

Strychnine Sulph or hydrochlor	gr.	1/100
Atropine sulphate	gr.	1/200
Adrenalin	m.	5

When the pulse is very quick and there are no signs of respiratory involvement, atropine in the above prescription may be substituted by either strophanthon one c.cm. or digoxin— in suitable doses till the pulse is reasonably slowed down. But in enteric-fever due to action of the toxin the

heart is more or less slower in comparison with the temperature. Some workers advocate half a c.cm. of pituitrin every eight hourly in cardic weakness, notably when in association with meteorism. Injection of adrenal cortex "cortin etc" may be of use.

Cyanosis and dyspnoea indicate giving of oxygen, by intranasal method, through a soft catheter at a brisk rate (see pneumonia).

Injection of glucose and insulin appears also to be good for the heart. Such other remedies like caffein sodium benzoate, strychnine and digitalin, camphor in oil or ether, may be injected every six to eight hourly according to indication.

Treatment of special symptoms and some common complications.—

Alimentary system.—*Constipation.* Many cases, specially when properly managed or of a mild type, may show constipation all throughout the course of the disease. This should be relieved better by glycerine enema of an ounce each of water and glycerine given either by a glass syringe or an enema. Glycerine suppositories may also be used. Ordinary normal saline enema of not more than half a pint may be used with advantage. Bulky enema in the third week or later, has induced intestinal haemorrhage in a few cases, under my observation. These need not generally be given more frequently than on alternate days. Sometimes if the proportion of sugar or fruit juice or soups in the diet is increased slightly, there may result a normal motion, but there is a risk of setting up a diarrhoea if overfed on sugary diet.

Initial purgative.— The exhibition of hydrag sub-chloride—in one-fourth to one-eighth grain doses with one grain of pulv rhei co. to make up to four grains with sodium bicarbonate per powder, every half an hour, in the evening, till four to eight such are given, has got many advocates. But this is only allowed during the first week and not later in the disease, as it may initiate a hitherto absent diarrhoea.

Diarrhœa.—Diarrhoea may be present all throughout the disease in some patients. If it is of a mild type, a little adjustment of diet is all that is required. Generally the reaction of the stool in these cases, as found by litmus paper, is acid due to fermentation of sugar in the diet. Broth, soups, fruit-juices and sugar should be avoided, at least for the time being, for a day or two. If curds appear in the stool the milk should be diluted, or citrated or peptonised. These curds often dis-

appear if the milk is diluted either with barley water or gruel. When diarrhoea proves refractory to the above measures, ten to thirty grains of bismuth oxide or carbonate thrice daily, or starch opium enema, made of tincture opii, half a dram added to two ounces of boiled starch given rectally, may be of some good. Tannalbin in half a dram doses thrice daily may be effective. Dover's powder in one to five grain doses twice or thrice daily may be the last resort in bad intractable cases. When the diarrhoea is serious and persistent there are greater risks of haemorrhage and perforation of the gut. A gentle wash of the bowels with warm saline in small bulk may be useful in some cases.

Meteorism. It may be due to errors of diet, but in serious cases meteorism may be a manifestation of toxaemia. It may be necessary to replace, in cases of dietetic disturbance, the milk or sugar diet by whey or albumin water or Mellin's food, calcium whey etc. Intestinal antiseptics are of doubtful value, but ten to fifteen minims of oil of turpentine, in an emulsion every six to eight hours may be tried with advantage, but its use should not be prolonged, as kidneys may be damaged. *Turpentine stupes* properly given are of value. In each pint of boiling water two drams of oil of turpentine are added and a thick flannel or thick linen in several folds is wrung out of it, in the meantime a few drops of turpentine are rubbed on the abdomen. The hot cloth is used as compress and covered by oiled silk, all these are covered by a pad of cotton and bandaged or covered by a towel. But care should always be taken to see that the compress is not too hot to burn the skin. Twenty to thirty minutes spent for this purpose often suffice. In some cases application of ice over the abdomen may be more suitable than warmth.

Turpentine enema consisting of half an ounce of the oil turpentine stirred in six to eight ounces of starch water, given high-up rectally and left therein may relieve distension. In extreme cases injection of half a c.cm. of pituitrin of 1/50 gr. of eserine or 0.1 gram or 1½ gr. of acetylcholine repeated every six to eight hours may be the last useful remedy. Lavage of the intestines by two to four pints of warm saline, with great care and gentleness may be of some effect. Passage of a Ryles Tube intranasally to washout the stomach may be of some use. Injection of prostigmin one ampoule may be the last resort in serious distension not responding to other forms or therapy.

High Rectal tube.—A flatus tube or in its absence, a stout catheter may be passed high up about six to twelve inches or higher and allowed to remain there for a few minutes to half an hour. The patient may have to be turned from side to side to facilitate escape of wind.

Milk and Molasses.—In out of the way places eight ounces each of milk and molasses warmed to a thin consistency, cooled at body temperature, may be used with advantage as a high retention enema in these cases of gaseous destension of the abdomen.

Haemorrhage.—The important points diagnostically are,—by the second or third week or later in the disease there is a sudden drop of the temperature below normal specially in severe hemorrhage. Gradual and comparative quickness of the pulse is present and the latter tends to be thready, soft and compressible. In extreme cases there may be beads of perspiration appearing on the forehead. Paleness, restlessness, hurried respiration may indicate a severe haemorrhage. Later on tarry stool is diagnostic. In small haemorrhage there may not be a subnormal temperature. The spleen may shrink in size.

Management.—

Absolute rest physical and mental should be ensured.—For this purpose besides a quiet dark room, one fourth to one sixth of a grain of morphine with one hundredth of a grain of atropine, may have to be given subcutaneously, specially when there is much restlessness. The disadvantage of morphine atropine is that the former tends to mask local symptoms, and as one fifth of the cases of perforation are accompained by haemorrhage this may interfere with the diagnosis of the former condition. In doubtful cases luminal group or chloral and bromide should be given to combat the restlessness, and morphine withheld, till perforation is excluded.

During the use of bed pans the *evertion may be too much*, hence they are preferably avoided, and only tows or several folds of newspaper used to collect the faeces and every motion kept for inspection.

An *ice cap lightly touching* the right iliac region hung from a cradle, should not be kept for more than a day. Between the skin and the ice cap there should be a layer of lint or flannel. But it may promote peristalsis in some cases. The foot end of the bed may have to be raised by bricks or blocks of wood, notably in severe haemorrhage and the feet of the patient kept warm. No. food is allowed for first

twenty-four hours except small sips of cold water or bits of ice to suck. Then milk or its modifications are given in small amounts cooled properly. Some believe in giving sips of a mixture, containing one dram of adrenalin chloride solution in eight ounces of distilled water, cooled.

Haemostatics. One of the efficient is one grain of *calcium chloride* in ten minims of sterile water, given deep into the muscles of the buttock. This helps probably by mobilising blood calcium. *Calcium gluconate* ten per cent solution in five c.cm. doses intramuscularly or per vein may be tried. Whole blood ten c.cm. from the nearest healthy relation, given intramuscularly may be of use. *Horse serum,* even anti-toxins may be given. *Congo-red solution* ten c.cm. of a one per cent solution per vein is reported favourably by some. *Sodium citrate solution* five to ten c.cm. of a ten per cent solution intramuscularly or intravenously may be of service. These may have to be repeated every twelve hourly, according to indication. Congo-red probably acts by the stimulation of the reticulo-endothelial system, sodium citrate by destruction of the blood platelets. K. vitamin injections may be useful.

Saline.—Subcutaneous saline one pint, with ten per cent glucose may have to be given every twelve hours in cases of haemorrhage, to combat dehydration and starvation. But this should preferably be started after twelve to twenty four hours, giving enough time for the formation of a hard clot, and then help to increase the volume of blood.

Low blood pressure following haemorrhage need not alarm one as it is nature's method of producing the clot, and stopping the bleeding.

Subsequent Constipation.—This, following haemorrhage should not bother the doctor, unless there are symptoms. Straining at stool should be avoided. Oil enema or glycerine and water rectally may be tried on the third or fourth day.

Perforation.—All abdominal pains in typhoid fever after the first week should be taken seriously and unless proved otherwise indicate perforation.[12] The symptoms are—sudden onset of abdominal pain late in the second week or later in the disease—associated with nausea, vomiting and symptoms of shock, sudden increase in pulse and respiration rate. Temperature falls, then may rise, obliteration of the liver dullness, rigidity locally and symptoms of an acute abdomen may be found. Polyuria may precede perforation.

12. Stipa (1935) Policlinico. 1935; 42: p. 2264.

Surgical intervention should be immediate and prompt in order to save the life of the patient. A case of perforation in typhoid fever on the twenty second day in a boy of twelve years was saved in the Medical College Hospitals, Calcutta, by timely operation. When conservative treatment has got to be resorted to, due to the patient being beyond the reach of surgical aid, Fowler's position, warmth, fluid, saline glucose injections are indicated. Absolute rest, morphine atropine for pain may cause euthanasia in a case of perforation, beyond the reach of proper surgical interference.

Antigas-gangrene serum, sulphonamides, penicillin. streptomycin etc. should be tried in adequate doses and proper intervals. These may be life saving.

Cholecystitis.—This is diagnosed by local pain, rise of temperature, quick pulse, palpable tender gall bladder etc. Treatment consists in giving glucose alkalies and urotropine five to ten c.cm. with glucose twenty-five per cent five to ten c.cm. twice daily. Locally, fomentation, linseed poultice, antiphlogistine are of benefit. The following prescription with or without decholin may be used with good result

Urotropin	gr.	10 to 30
Soda Bicarbonate	gr.	20 to 60
Tr. Belladonna	m.	6
Syrup orange	m.	60
Aqua Chloroform	upto fl. oz.	1

one dose four times a day. But in rare case urotropine may produce haematuria specially when given along with acid mixture. Some use cylotropin too. Intravenous *Cylotropin* may be more useful.

Parotitis.- Improper oral hygiene, want of suitable toilet of the mouth, bad teeth, dorsal decubitus for a long time allowing free access of bacteria directly through the parotid duct, even by gravity, and want of the flow of the salivary secretion and so on appear to contribute to the infection of these glands.

The flow of the secretion is promoted by asking the patient to chew either some cloves, ginger or sour lemon every two to four hours. In unconscious persons the tongue may be touched with a swab dipped in either oil of cloves or cinamon or even peppermint evey few hours. Locally warmth may be applied over the gland in the form of hot compress or fomentation or antiphlogistine or poultice. Four to six hourly gargling the mouth with a solution like the following has given satisfactory results.

Menthol	gr.	10
Oil Cloves	m.	30
Rect. Spirit	m.	120
Glycerine	m.	60
Saturated solution of Mag Sulph upto	fl. oz.	8

Listerine group of mouth washes, used twice daily may prevent it. Locally an ichthyol and collodion paint of the following type on the skin over the inflamed gland may be useful

Ichthyol	m.	120
Extract Belladona Siccum	gr.	10
Collodion upto	fl. oz.	1

to paint on the parotid region three or four times a day.

Phlebitis.—The commonest site of thrombosis is left femoral vein because of its anatomical position. The leg should be elevated—kept at rest on a pillow. One should never allow the limb or the thrombosed parts to be rubbed. Movements are better avoided, but when indispensable, need great care. Cold compress or ice application given very lightly avoiding friction or pressure, specially at the onset may do good. Warm flannel bandage or cotton wool wrapping lightly applied and the parts kept covered and warm is of benefit. Bath and massage should always be avoided. Heparin and dicoumarol sold as "Temparin" (Herts) in 10 to 20 thousand units of former and 200 to 400 mg of the latter and repeated in smaller doses by injection may be useful.

Typhoid Bacilluria.—This is best treated by exhibition orally of hexamine and ammonchloride in ten to fifteen grain doses each by the third or fourth week of the illness.

Cystitis—may have to be treated on its own lines. Hexamine theatment, should either precede or follow alkaline treatment (see Cystitis).

Bone-lesions.—This somewhat rare complication may take place either at the height or decline of the fever. Pain in the bony regions with other signs of inflammation are the first to attract attention. Application of ice bag over the area is soothing and causes the swelling to subside. When it suppurates draining should be done and a surgeon consulted.

Typhoid Spine. Though, fortunately very rare, demands perfect immobilisation, local rest, avoidance of strain etc. The opinion of a surgeon may be of great help.

Tender toes. These should be treated by the application of tincture iodine and hot compresses.

Multiple boils.—The parts should be kept clean, and dry. The skin should not be allowed to get sodden. Injections of colloid manganese or oral use of sulphonamides may do some good. The general resistance of the patient should be raised by proper diet, rich in all the vitamins. Auto-vaccines given subcutaneously may be tried.

Drug Treatment.—Intestinal antiseptics are of doubtful efficacy. Some are in favour of giving *tincture ferri perchloride* in ten to fifteen minim doses thrice or four times a day, and it may help in keeping the meteorism and fermentation down. During the earlier febrile stage an *ordinary alkaline mixture* is given by most physicians to be followed later on in about the second week by *an acid mixture* the active constituent of which is dilute hydrochloric acid. The average prescriptions are

Alkaline mixture.—

Potassium acetate	gr.	10
Soda Bicarbonate	gr.	10
Pot. Citrate	gr.	10
Liquor Ammon Acetatis	m.	60
Syrup orange	m.	60
Aqua chloroform upto	fl. oz.	1

one dose, three to four times a day.

The acid mixture.—

Acid hydrochloric dil	m.	10 to 30
Tincture Ferri Perchlor	m.	10
Syrup Rose	m.	60
Peppermint water upto	fl. oz.	1

one dose thrice daily after some food. This acid treatment appears of use and is worth a trial.

The old *Chlorine mixture* has fallen into dis-use.

Cinnamon oil.—This in two to five minim doses thrice daily in emulsion or cachets has got numerous advocates. They use it all throughout the course of the disease.

Oral Vaccines.—Melnotte and Farjot (1937)[13] gave orally vaccines amounting to about two hundred c.cm. in between meals for several days. The average mortality in a series was twenty-six per cent whereas the group of two hundred and ten cases treated by oral vaccine had about ten deaths, nearing a percentage of five per cent. Others have

13. Compt. Rend Soc. d. Boil, 1937, 97 : p. 338.

confirmed these results and such treatment is worth a trial specially due to its easy applicability.

Serum.—

Rodet's Serum.—(Med. Annual 1934 and '35) is useful if employed early. They advocate first dose—twenty to twenty-five c.cm., second dose fifteen c.cm., third dose ten c.cm. If given during the first to third days, serum aborts the disease. From the fifth to eleventh day favourable, later, in the disesae it is of use also. Effective in typhoid, para A, but useless in para B infection. Felix's[14] (1935) anti-typhoid serum is also favourably reported.

Robertson and Yu (1936)[15] treated fifty-two Chinese patients by serum with good result. Latin and his co-worker (1936)[16] report favourably on blood-transfusion therapy in forty-one very severe cases of typhoid fever.

Bacteriophage,—is of very little use in this systemic bacteraemia.

Bruschettini's Vaccine: (*Typhoid, Coli group*).—Given in one-fourth c.cm. doses, till four to six such are given on alternate or every third day, is of distinct service specially in the later febrile stages when everything seems cleared up, but the unaccounted for temperature is still lingering. The present writer has treated about twenty such cases with good results. Daria (1935)[17] records favourable results by vaccine therapy.

Convalescence.—Careful management of the convalescence is of great significance, as relapses with some complications may appear during this time. The diet should be increased very slowly, and with due consideration to the severity of the disease, condition of the patient his appetite, digestion and so on. Every case should be individualised on its own merits. The patient should be allowed to sit upon the bed for gradually increasing hours, generally seven to fourteen days after defervescence. Seldom the patient is fit to resume work before two to three months rest is given preferably in a better and bracing climate. Gradually the diet should be made rich in the vitamins, fruits, milk, egg, butter etc., meat is to be added cautiously.

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14. Felix (1935) Lancet; p. 799.
15. Brit. Med. Jour. 1936, ii. p. 1138.
16. Amer Jour. Med. Sci. 1936; 191 : p. 8,0.
17. These de Paris 1935- p. 318.

Not uncommonly *excitement, too much reading, prolonged* talk with visitors cause a rise in the evening temperature. For such cases a quiet and more restful living during convalescence is indicated. There also are cases with a persistent evening rise of temperature without any obvious cause. They are sometimes best controlled either by Bruschettini's vaccine or injection 2-5 c.c. of milk protein, or a powder like the following given orally

Cryogenin	gr.	1 to 2
Aristochin	gr.	2
Cal. Lactate	gr.	5
Sugar of milk	upto gr.	12

one powder every four hours in the afternoon till two such the taken. Cryogenin may make the digestion a bit dull, but that only temporarily.

Intramuscular injection 5 *to* 10 c.c. of healthy blood in the gluteus on alternate days till 2 to 4 or more such are given has helped in some of our cases to bring down the lingering temperature in the latter part of typhoid fever.

Unduly *slow or quick pulse* generally requires no treatment. Return to work should be cautious and gradual according to the nature, and duration of the work and the severity, type and length of the illness.

Tonic.—In most of the cases a tonic containing iron, arsenic, nuxvomica, hydrochloric acid, and all the vitamins given after meals in suitable doses may be of distinct use to hasten the recovery.

Carriers.[18]—These convalescent carries may be the sources of future epidemics by periodic excretion of showers of bacilli either in the stool or the urine[19]. The gall-baldder once infected is extremely difficult to sterilise. Massive doses of vaccine was tried without success but recently the gall-bladder is being removed[20] with variable result. There is greater incidence of gall stones in these persons who suffered form typhoid fever than in those who were not infected.
Until the patient ceases to excrete the bacilli in the stool, he should not be allowed to mix with people, specially he should not be allowed to handle food or employed in cooking. The urinary carriers should take acidifying drugs and

18. Jour. Amer. Med. Assoc. (1936); 106: p. 1826.
19. Hassen (1935) N.Y. State. Jaur. Med. 1935; 35: p. 1206.
20. Coller and Forsback (1937) Ann. of Surg. 1937: 105: p. 791.

urotropine in proper doses. The mandelic acid group of drugs may be of some help in this direction. Injection of *streptomycin* and orally some of the dyes used for cholecystography has been used with some success to prevent the carrier stage.

Prophylactic Oral Vaccines.—Bili-vaccine orally is of variable prophylactic value. As these are absorbed according to the digestibility and power of assimilation of the person hence it is not always safe.[21] Typhoral vaccine (Bayer) is said to be of use prophylactically.

Mental changes. There may be nervous or psychological defects which also demand care[22] and proper management.

Para typhoid group of fevers demand the same lines of management as indicated above.

CHAPTER XIII

PNEUMONIA GROUP.

Epidemiology.—These groups of diseases appear to be on the increase in big cities due to over-crowding lowered resistance resulting either from some concomitant debilitating disease, or due to less of out-door life, greater facilities of transport of carriers, crowding in halls of amusements etc. Since the last pandemic of influenza—there is a greater tendency to bronchopneumonia than to lobar pneumonia[1]. Though in the typical cases diplococcus pneumonae is the causative agent— yet there may be strepto or staphylo cocci, pneumo baccilli, micrococcus catarrhalis etc., present, specially in atypical ones. Pneumonias are common during the winter months.

Ætiologically.—Increased virulence of the microbes, lowered body resistance due to sudden exposure to cold, trauma, immersion in water or getting soaked in rains, unsuitable and insanitary dusty or dirty occupation tend to help in the spread of the disease by droplets and other modes. There may be aspiration or inhalation pneumonia. Death

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21. Bull of internat d'Hyg. publ. 1934 : 36 : p. 1741.
22. Dufour and Froment (1934) Presse Med—1934—42 : p. 1225.
1. Wynn (1932) Medical Annual 1932. Pneumonia etc.

rate is higher during the[2] dry months than in humid atmospheric conditions.

Predisposition,—is caused by all debilitating affections—such as alcoholism, diabetes-mellitus, cancer, cirrhosis liver, tuberculosis, nephritis, arteriosclerosis, heart disease, influenza, typhoid fever, pulmonary tuberculosis and so on. A previous attack makes the patient more susceptible to another.

Diagnosis.—There is hardly any disease which is more easy to diagnose than a typical case of lobar pneumonia. Atypical ones may be confounded with acute tuberculous pneumonia, in extremes of age with broncho-pneumonia, pulmonary congestion and infarct, atelectasis, and important of all pleural effusion. In central pneumonia there may be difficulty in diagnosis even for days.

But generally the characteristic type of onset with chill and rigor, pain in the chest, altered pulse respiration ratio, high rise of temperature, the hot burning often dry skin, the peculiar breathing, sugest the disease. There is as a rule a cough and after a time rusty sputum. Herpes is not so common in our country. By palpation a greater resistance is felt on the diseased side. Percussion note may be dull or flat on the affected side of the chest as compared with its healthy fellow. Air entry, at the early stages in the affected side, specially near the hilar regions on the back, is either poor or deficient. Later on the breath sound changes to the characteristic tubular type. The vocal fremitus and resonance is increased on the affected side. Pneumonia is a disease of protean manifestations and present abnormalities in type, specially in the debilitated persons and at extremes of age. There may be even fatal pneumonia in persons of very low vitality without any fever.

Differentiation.—has got to be made from influenza complicated with pneumonia. Commonly influenzal attacks accompany broncho-pneumonia and they may have to be differentiated form lobar pneumonia, pleural effusion, sub-diaphragmatic abscess, inter-lobar empyema, addominal inflammations, and other conditions likely to be confused with pneumonia group of diseases.

Complications are varied and numerous.—Delayed resolution is common in cases where there is outcrowding

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2. Norris and Farley (1925). Oslers Modern Medicine vol. I Lobar Pneumonia. p. 186. Lea and Febiger publication.

of the reticulo-endothelial system as in kala-azar. Empyema, abscess, gangrene are not uncommon too in the debilitated or under-nourished subjects, and also in subjects of kala-azar. Meningitis, otitis-media, peritonitis, arthritis are also encountered. Various types and grades of heart involvement are also not uncommon. Albuminuria is frequent. Mediastinitis is rare.

Sequelae,—are liability to subsequent attacks, some permanent pleural thickening, rarely fibrosis and bronchiectasis, the latter two are more common after lobular than after lobar pneumonia.

Culture of the sputum, and skiagraphic examination of the chest are being utilised recently in America[3] for early diagnosis.

Mortality rate.—This varies, besides other causes, according to the age and former health of the individual the type of the pneumococci concerned and the severity of the infection. Marked debility, with some of the chronic exhausting diseases, in fat persons, and in diabetics, alcoholics and others the out-look is bad.

Broncho-pneumonia or Lobular Pneumonia.—It is commonly met with in extremes of age and is usually secondary to attack of some other infections such as influenza, measles, whooping cough, diphtheria and so on. The temperature is irregular and more prolonged and with greater fluctuations. The signs in the lungs are patchy and bilaterally distributed, with variable areas of consolidat on and healthy patches intervening between each other. There are rhonchi and suggestive adventitious sounds in both the lungs. This type of infection even in adult life is not uncommon now-a-days, specially since pandemic of influenza of 1918-19. The complications, sequelae etc., are almost the same as in cases of lobar pneumonia. Recently *primary atypical pneumonia*[4] usually with gradual onset, lack of respiratory distress not much favourably influenced by sulphonamides and penicillin has been reported[5].

3. Jour. Amer. Med. Assoc. 1933. August 12th 101. p. 514.
4. Adams, Stavaley Rolleston et al (1946 Feb 16) Brit. Med. Jour. p. 227.
5. Curnen, Mirick et al (1945 Mar) J. clin. Invest 24 p-209-226.

TREATMENT

Though there is difference of opinion as to the details of the methods of treatment of pneumonia or broncho-pneumonia, yet on the broad principles there appears, more or less, some degree of general agreement, notably after the introduction of sulphonamides and penicillin.

Specifics :—*Sulphadiazine and penicillin* are real specifics in most of these infections, the former is cheap easy to administer even in rural areas, and quite effective in most cases and should always be the therapy of first choice. The dose should be adequate and continued for five to seven days or longer. If given in inadequate doses as two tablets thrice daily as seen in practice is hopelessly insufficient and there is the serious risk of producing sulphonamide resistant organisms, a real danger in out of the way places, and *penicillin remains to be the only resort in such sulpha-resistant cases.* Indications of penicillin treatment in pneumonia group of diseases is given on page 52 and sulphonamide treatment on p. 27 etc.

Though *leukopenia is said to be a contraindication to sulphonamide therapy* yet in actual practice in several such cases we met with no trouble whatsoever. I am glad to be able to volunteer the information that actual trial on several hundreds of cases of pneumonic infections treated with adequate doses of sulphonamides preceded each time by an alkaline mixture there was practically no case of toxicity. We always used sulphadiazine, average dose being four tablets first, two every 4 hourly till temperature was normal, then 2 tablets six hourly for 5 to 7 days or longer. Early *cessation of the drug i.e. before the 5 to 7 days, often causes the symptoms like fever etc to reappear.* In serious or unconscious cases sodium sulphadiazine intramuscularly or per vein 3 to 4 g initially, to be followed six hourly by half the above dosage is essential for an adult till he can take tablets orally.

A comparison of penicillin and sulphonamides in pneumonia[6] :—Comparison of a hundred cases showed (1) Response to the two groups were almost identical with the exception that penicillin caused an abrupt fall of temperature and fewer extensions to the other lobe. (2) Ten thousand or more units per dose of penicillin was more effec-

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6. Kinsman et al (1945. Aug. 25.) Jour. Amer. Med. Ass. 128 p-1219.

tive than smaller ones—the latter dosage caused more relapses and failures. (3) Penicillin in beeswax and peanut oil mixture when injected in proper dosage and intervals appear effective in pneumococcal pneumonias. (4) Primary atypical pneumonias are not favourably influenced by any of these drugs.

Sulphonamides—cause larger percentage of delayed resolution specially in persons above 40 years of age in pneumonias than in pre-sulphonamide days, but prolonged therapy ultimately cures them.[7]

Oral use of penicillin though effective may not be very safe in this serious infection as the power of assimilation varies in persons, hence should preferably be supplemented by injection of penicillin .

N.B. Bronchitis and bronchopneumonias are also cured by the above lines of sulphonamides and penicillin therapy.

Rest.—Absolute and perfect rest in bed is essential. When there is much difficulty in breathing the propped up posture is of some relief. This should always be done properly by some strong support for the back and the leg should be kept bent at the knee, supported by means of a round pillow tied and fixed in position from the ends, thus preventing the patient from slipping down. Suitable dependable attendants should constantly look after the patient where trained nurses are not available. Turning the patient in the acute stage from side to side, even for examination may prove risky. "Twice I have witnessed oedema of the lungs precipitated by the act of turning the patient for purposes of examination".[8]

Undue disturbance.—The patient should not be dis turbed unnecessarily after the initial examination to find out the site, nature, and extent of the disease. Repeated examinations are exhausting to the patient, and serve very little useful purpose. Typical physical signs may not appear even in two to three days' time, but the site of pain, limited movement, local rigidity, impaired percussion note, deficient air entry and an occasional fine crepitus suggest the site and extent of the mischief. See also page 19 and onwords.

7. Ross (1945. Feb) Glasgo. Med. Jour. 25. p. 59-65.
8. Meara (1921). Treatment of acute infections diseases. Second Edition 1921. p. 146. Macmillian Co., N.Y.

As regards the details of the care of the mouth, teeth, tongue, skin etc., corresponding paragraphs under the treatment of fever should be consulted, for this see chapter on fever, page 20 etc.

Ventilation, Room etc.—The room should be properly chosen and very well ventilated. Fresh air stimulates the heart and the respiration, and supplies the requisite oxygen and relieves air hunger, promotes sleep, quietens restlessness, and improves digestion. When cool fresh air plays on the face and head of the patient, blood pressure improves, and not uncommonly he feels refreshed. In our tropical country, these diseases may very advantageously be treated in open verandahs. Even in December nights one need not be afraid of cold and the doors and windows should be kept wide open. But cold draughts or glaring sunligts should reasonably be guarded against. *Visitors are undesirable.*

In the matter of ventilation the unwilling public need to be educated and the fact that a person with high temperature cannot catch cold easily, should be impressed upon.

The garment should be adequate but conveniently fastened for routine sponging and toilet of the patient. The peculiar morbid fear of cold often makes the fond parents overload children with thick warm clothing, which interferes with the free movement of the chest. This is to be discouraged, and reasonably warm clothing for the winter and pleasantly tolerated garment for the hot months should be advised.

Initial Chill or Rigor.—During the stage of initial chill or rigor the patient should be covered with adequate covering of blankets or quilts. Hot water bottles well covered, or electric baths where available may help during the distress. Hot drinks like tea, coffee, cocoa, or hot lemonades may be of use.

Preliminary Purge, etc. Though there is difference of opinion as regards giving of the preliminary purge, yet clinically there is some justification in giving divided, say one-fourth grain doses of hydrag sub-chloride, totalling upto one to two grains, at quarter to half hourly interval, followed by some mild saline. In early cases this may be tried but in the later asthenic stages simple enema is the evacuant of choice. There are observers who are against

any bowels movement being induced by purgatives[9] When seen late in the disease and there is distension or tympanites a simple glycerine enema of an ounce with equal amount of warm water, or a simple glycerine suppository may be all that is required to cause an evacuation. If the patient's condition permits, simple saline or soap water enema upto one pint may be used with advantage. *Diarrhoea* in pneumonia is common and generally means intense toxaemia and appears to be another means of excretion of toxins. Unless very exhausting it need not be checked by bismuth, kaolin or Dover's powder

Diet and Fluids,—for details see pages 14, 15, 16, 17 etc. When the digestion is not affected, skimmed milk in five ounce feeds every four hourly may be taken except at night. In other cases the milk may have to be citrated or peptonised. Simple skimmed milk or with Benger's food is suitable. But as the appetite of the patient improves—other articles, like milk and sago, baked custard, soft poached eggs, mashed potatoes may be allowed.

Injudicious forcing of food in an unwilling receptacle may result in tympanites and diarrhoea, which should be avoided. *Always plain cold water should be given as much as possible*, even when the mental torpor of the patient prevents him from asking for it. Water should be exhibited to him at regular intervals by an attendant, every fifteen minutes to half an hour, in four to eight ounces and as much as he can take. It is our only medicine which can wash the individual diseased cells of the system and helps materially to get cured.

Two per cent saline orally.—There is deficient excretion of chlorides in pneumonia. May we interpret it as an effort on the part of the human system to combat the dehydration by retention of sodium ions which in their turn retain water and thus combat the intense internal dehydration of a toxic disease like pneumonia? Beckman[10] (1934) advocates about ten to fifteen grams or about four to six drams of sodium chloride to be given to the patient daily by various methods during the earlier period of the infection.

Sleep.—To procure sufficient sleep may be a matter of difficulty. The patient usually fights with the disease with

9. Wynn (1936). Treatment in general practice. p. 14. Lewis publication, 1936.
10. Treatment in general practice 1934. Pneumonia. p. 130. Second Edition. Saunders publication.

occurs, it is nearly always due to the failure of the circulation. From the very beginninng, therefore, the maintenance of the strength of the heart and of the tone of the peripheral vessels should receive our best attention and care.[12] Perry[13] (1934) supported by Ritchie has shown that circulatory failure in lobar pneumonia is really a failure of the circulation at the periphery. Warfield (1936) has noted that it is not the heart that fails in acute infections, but the peripheral circulation collapses, so that the heart finally has no blood to pump, a condition, according to him, analogous to secondary shock. He notes "The heart usually becomes smaller in acute infections until just before death, when it dilates because of anaemia." For details see chapter on fever. Intranasal use of Ryles tube for food drink and hydration as on p. 17, is found useful in unconscious and toxic cases.

Digitalis Group.—Recently the workers in the Bellevue hospital have shown that routine treatment of pneumonia by digitalis is not justified according to their statistics. The mortality in 338 patients treated with digitalis was 41.4 per cent as compared with 33.7 per cent in the control series of 404 cases.[10]

But more recently Cohn and Lewis[14] (1935) in their detailed investigation, into the value of digitails in the treatment of pneumonia, find that administration of digitails has little influence on mortality except when cardiac complications are present. The balance of evidence is that digitalis does no harm and may be slightly beneficial. They have also criticized the workers of the Bellevue hospital because they did not attempt to weigh the severity of the disease, and also that their figures are indeterminate and their condemnation of digitalis is based on a very scanty evidence. Recently suprarenal cortex injection, cortin, eschatin, etc. have been found of some use.

Early treatment.—But it should clearly be laid down that the treatment of the cardio-circulatory failure of pneumonia is mainly preventive and that with the first appearance of the least sign of any weakness or insufficiency of the circulation, prompt treatment of all the conditions affected, may do much, whereas late in the disease, the best of cares and treatment may prove quite ineffective. But interference

12. Moses (1932) N. Y. State. Jour. Med. 32 p. 863—864.
13. Quart Jour. Med. 1934, 3. p. 273. April.
14. Jour. Amer. Med. Sci.—1935—April. 189: p. 457.

should be done according to indications and not as a routine. Cases, need most individualisation here.

Routine Stimulant Treatment.—This, without any indication, generally betrays a lack of judgement, as Norris (1925) (Osler's Modern Medicine, Vol. I.) has very ably said "On the other hand nothing can be more reprehensible than routine stimulation. A great nicety of judgement and one which can only be acquired by wide experience is required to decide just when and how much to stimulate. No absolute rules can be laid down but certainly it is better to err on the side of understimulation. The greatest benefit of the fresh air treatment lies in the fact that patients become less toxic, so that in the average case no stimulation is required."

Some Drugs. Diffusible stimulants—*like camphor in oil or ether* in one c.cm. doses intramuscularly every four to eight hourly in weak subjects, may be beneficial. *Cardiazol* — orally one tablet, crushed, every four hourly, or injections of 1.1 c.cm. of a ten per cent solution every four hourly may be tried.

Cycliton, Coramine and Veritol. Coramine—in 1.7 c.cm. ampoules by subcutaneous injection, or orally two to five c.cm. doses every four to six hourly may be used. *Veritol* is useful as a stimulant both of the cardiac musculature as well as of peripheral circulation. These appear useful in pneumonia. These are mostly nikethamides.

Ardenalin, Ephedrin and Pituitrin,—better pitressin group are of use in peripheral circulatory failure. The first two may be combined in half a c.cm. and one-fourth to half a grain doses respectively every six hours subcutaneously. But quickening effect on the heart rate, by ephedrine group should be remembered. These when injected may give rise to unpleasant palpitation, in some susceptibles.

Calcium Gluconate or Levulinate.—Calcium levulinate has fifty per cent more of available calcium than in calcium gluconate. According to Zapel[15] (1934) calcium in pneumonia acts in the following way.

(1) It stimulates the sympathetic nervous system, (2) acts as an anti-inflammatory, (3) reduces the irritability of the cerebral cortex, (4) alters permeability of the tissue membranes favourably, (5) has a digitalis like action on the heart and circulation. Hence calcium and digitalis should not be

15. Duet. Med. Woch. (Liepzig) 1934. Feb. 7th 60: p. 207.

given simultaneously in big doses, as their additive effect on the heart, may promote cardiac asystole. Generally calcium is given in the form of gluconate in ten per cent solution five to ten c.cm. intramuscularly or per vein, every twelve hours. When given properly diluted with glucose solution it is of use.

Glucose and Insulin.—Recently some[16] workers have treated cases of pneumonia with injections of glucose and insulin, the dose of glucose being double in gram as per unit of insulin. Kharkov[17] (1936) in his studies of insulin therapy in pneumonia of the aged, regards this infection as a state of non-diabetic pathologic acidosis, running a course characterised by a pronounced anoxaemia with a considerable increase in the blood sugar, breaking down of albumin and fat with marked lowering of chloride metabolism.

Moisture or water or steam inhalation.—In the dry months the death rate in pneumonia appears to be higher than that during the wet months. The moisture may well be supplied in the form of inhalation of tincture benzoin compound either through a steam inhaler or by any such suitable device. Where this is not available some water may be boiled in the room, and tincture benzoin compound added to it.

Cyanosis etc.—This is best combated by constant open air treatment. But wherever available oxygen should be given best by the tent method, though this is out of the question in this country as yet. It is said to be life saving. The old funnel method is worse than useless, and though may produce some psychic effect on the patient and his relations, yet scientifically appears to have very little physical effect. It should be given through a medium bore catheter, say, No. ten, pushed well back into the nasopharynx and at the rate of two liter per minute. According to Haldane in England and Barach in America, this is best given in the form of carboxygen,[18] consisting ninety-five per cent of oxygen and five per cent of carbon dioxide. This according to most workers is the ideal agent for all forms of defective oxygenation specially in pneumonia with tachypnoea, cyanosis etc. This inhalation of oxygen

16. Jour. Amer. Med. Assoc. 1933. 18th, March. p. 798.
17. Ibid 1937, January 2nd. 108: p. 81.
18 Boothby, (1932). Jour. Amer. Med. Assoc. 1932. Dec., 10th: p. 2026.

should be continuous, as according to Boothby (1932) intermittent oxygenation has no effect whatsoever. If the nasal catheter is irritating, which unfortunately is generally the case, and the semiconscious patient pulls it out due to its irritation, not only should the catheter be fixed on the cheek by a strip of adhesive plaster but also it is always preferable to smear the catheter, before insertion with a fine layer of ointment containing 0.5 per cent pantocain. Thus the local anaesthetic action of pantocain reduces the irritation almost to a minimum and the oxygen may be made to inhale without any risk of the tube being pulled out. To determine the rate, it is a rough workable plan to allow to flow the oxygen through water at a rate, so fast that bubbles may not just be counted. Oxygen is better made to pass through warm water or alcohol in a Woulf's bottle.

Vitamins.—Though enough work on the line has not yet confirmed the results, the injections of liver extract intramuscularly in two to five c.cm. doses daily have been advocated in cases of pneumonia with leukopenia.[19] More recently there is great enthusiasm over injections of vitamin C in the treatment of lobar pneumonia. It is given in the form of Redoxon, or Cantan, or Cebion injections, and is reported favourably by some workers. In all debilitated cases or where there are reasons to suspect a protracted course, or in the presence of any complication, the writer uses a routine of some of the easily digestible preparations containing A and D vitamin concentrates, like haliverol, or adexolin, or navitol and others. Tonics containing A and D vitamins, malt extracts, iron etc., are of special use in convalescence from these diseases, the familiar useful ones are ferradol, syrup minadex and similar preparations.

Alcohol in Pneumonia.—Though in most diseased processes alcohol is not allowed or is to be given with caution, in pneumonia of low and devitalised persons alcohol in the form of rum or brandy, in one to four drams, may be given at four to eight hourly intervals to tide the patient over. This should particularly be given in alcoholics. But Wynn (1937) in his article on the treatment of pneumonia remarks "Alcohol is not a cardiac tonic or a stimulant but a drepressant, and if called by its right name it would not so often be employed. With alcoholic patients it is customary to give it, but I have not found an increased

19. Wilson and Carey (1937), Amer. Jour. Med. Sci. 1937 June. 193 : p. 752.

delirium by withholding it in such cases. Statistics reveal an increased mortality with its use."

Leukopenia etc.—In cases with either frank leukopenia, or inadequate leukocytosis, besides injections of liver extract suggested above, nucleinate and cinnamates have been employed with variable success. For this purpose one to two c.cm. of a five per cent solution of sodium nucleinate given intramuscularly or subcutaneously every twelve hours may do some good. In very pronounced leukopenia pentnucleotide may be injected intramuscularly every twelve to twenty-four hours according to indication. Injection of pyridoxine (B) is useful.

Sera and Vaccines.—The advent of sulphonamide and penicillin and streptomycin for bacillary pneumonias has thrown the less important specifics like sera and vaccines in the back-ground. *Sera* are indicated in debilitated elderly patients along with the specifics. *Vaccines* may be used as a prophylactic and in delayed resolution or in other complications not responding to chemotherapy and antibiotics. (See also pages. 9,10,24,36 on the use of sera with penicillin etc.)

Treatment of Complications.—

Delayed Resolution.—Treatment should be directed to improve the general health and nutrition of the patient. A liberal supply of fresh air, is of distinct service. Locally counter-irritants rubbed on the chest may be useful. Camphorated oil is suitable too. A mixture like the following one may do some good.

Syrup Ferri Iodide	m.	60
Calcium gluconate	gr.	10
Sodi Salicylas (nat)	gr.	5
Sodi Bicarb	gr.	10
Syrup Tolu	m.	60
Aqua Chloroform upto	fl. oz.	1

one dose thrice daily.

Streptomycin—has been useful in pneumoniae caused by Friedlander and other bacilli. In mixed infection combined sulphonamide penicillin and streptomycin therapy may cure all cases of pneumonia, does not matter what the causative organism might be.

Prophylaxis.—The predisposing factors like, bad and unhygienic diet specially with prolonged lack of vitamins, bad sanitation, want of out-door exercise, overwork, worry, getting soaked in rains or getting chilled, and so on,

should be avoided and remedied wherever possible. In the hospital of the Rockefeller institute, America, all cases of pneumonia have been treated in individual rooms, all nurses and doctors attending them wear gowns and masks and so on.[20] Isolation of the patient and prophylactic inoculation may be of use. Sulpha drugs also may act as preventives of respiratory passage infection.

Convalescence.—This depends on the nature of the case, its gravity, supervention of any complication or not, presence of these meaning a cautious watchful care over this period. Reversion to work should be regulated and gradual. If there are any of the residual signs and symptoms, a change to a more bracing climate, a good vitaminous diet, rich in fats, proteins and fruits may be of value. Iron, arsenic, strychnine, malt extracts, milk, egg, butter, fruit juices, green vegetables, go a great deal to build up the lost resistance and general health of the patient.

CHAPTER XIV

TUBERCULOSIS OF LUNG

Diagnosis[1].—In its variety of manifestations pulmonary tuberculosis stands unique. The earlier the disease, the more difficult is the diagnosis. But there are other difficulties too, specially for the young practitioner and the student. In practice, what we do not look for in the patient is not generally encountered. Because of the extreme frequency of pulmonary tuberculosis, every physician should expect to see it in all cases with reasonably suspicious history.

The history of frequent *colds, persistent unexplained cough and expectoration, loss of strength and weight, vague indifferent health or failure to regain strength, or nervous breakdown after influenza or colds, specially when these symptoms are felt more aggravated in the evening,* digestive disturbances not explainable by ordinary means, slight shortness of breath, pain in the chest, blood spits, feverishness, tachycardia, pleurisy, etc., should arouse suspicion, specially if there is a history of exposure to tuberculous infection, either in the family or anywhere else. A tuberculous family history is a helpful additional point which

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20. Cole (1934) Canad. Med. Assoc. Jour. 1934. 30: p. 237.
1. Dhar, (1937). Ind. Med. Gaz. July 1937. 72. p. 409.

should receive only its proper share of not undue importance. But in our actual practice generally the patient seldom spontaneously gives out more than one or two symptoms, even when there are others to be elicited by the doctor by leading questions. Besides the history and complaints of the patient the important requisites for a proper diagnosis are—careful observation of the patient with record of *pulse rate, temperature, taken orally four-hourly, specially in the afternoon and at night, with a record of weight, characteristic or suspicious physical findings, skiagram of lungs, tuberculin test and others.* In all reasonably suspicious cases, the patient should be kept under observation and examined repeatedly until tuberculosis of the lung has in all probability, been eliminated. *Amenorrhoea in young women, may mean generally pregnancy or tuberculosis of the lungs.*[2]

The first indications are usually in symptoms than in signs and are extremely diverse and may relate to any organ of the human system, hence the difficulties of diagnosis are great, specially at the very early stages.

Pottenger lays stress upon motor and sensory symptoms, which are caused reflexly by the inflammation of the lungs.

Early pulmonary tuberculosis depends, in the great majority of cases, on probablities rather than on certainties, as the signs and symptoms may be indefinite and not always incompatible even in health.

Tuberculin tests may help in the diagnosis specially in the young.

Sedimentation rate of the red cells of the patients blood may assist in the diagnosis and prognosis.

For diagnosis the presence of one or more of the following are of help :—

(1) *Haemoptysis*, generally profuse but usually of more than one dram, is commonly said to be present in about sixty per cent of all cases (Osler, 1925).[3] But authorities differ in their figures varying between twenty-four to eighty per cent, depending, besides on other factors, on the stage of disease, the age and sex of the patient, and the time spent under observation etc.

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2. Marshall, (1937). Brit. Med. Jour. 4th Dec. 1937 p. 1103.

(2) *Pleurisy with effusion.*—A large proportion, about sixty-six[3] per cent, in a series of cases of pleurisy with effusion turned out to be tuberculous, as diagnosed by our modern methods including the *x-ray* findings. That all such cases are due to tuberculosis appears too sweeping a statement.

(3) *Persistent moderately-coarse crepitant rales* (Burrell, 1936)[4] above the third rib or the third vertebral spine, present even after coughing, were found in forty-two per cent of a series of cases analysed by Fellows (1934).[5]

(4) *Roentgenological findings* of a proper and positive type. In Fellows series of one hundred and forty-one cases of healthy applicants for life insurance, the x-ray examination of the lungs showed about sixty-five per cent in the minimal stage and about thirty per cent in the moderately advanced and five per cent in the advanced stage of pulmonary tuberculous infection. Recently tomography[6] has been solving the problem of localisation of cavities and others. In this connection the following remarks by Burrell[4] are noteworthy "physical signs are notoriously misleading in the diagnosis of tuberculosis of the lung, and it is possible for advanced disease to exist without any physical signs being detected even after careful examination by experienced physicians."

Kattentidt (1929)[7] of Munich has emphasized the importance of scrutinizing the suspicious cases by fluoroscopy. Taylor (1935)[8] stresses the importance of x-ray examination of the lung for the determination of the type of tuberculosis—either exudative or productive and so on. Mass miniature radiography is being utilised in western countries for detection of early cases.

(5) *The presence of tubercle bacilli in the sputum.* Failure to examine the sputum is inexcusable. One has personally seen great confusion in the diagnosis and consequently in the treatment of a case for the neglect of this simple but very important test. This is a very positive and diagnostic finding.

3. Osler's Modern Medicine Vol. I. Brown (1925) Tuberculosis p. 419. Lea Febiger publication.
4. Burrell, (1936). Med. Annual, 1935. p. 478.
5. Fellows, (1934). Amer. Journ. Med. Sci. 88 p. 533.
6. Mc. Dougall, (1937). Tubercle, 19 : p. 50.
7. Kattentidt, (1929). Zeitschr. Tuberculose, 55 : p. 193.
8. Taylor, (1935). Journ. Amer. Med. Assoc. 104 : p. 898. Lloyd (1945) Medical Annual p. 186.

Due to its protean manifestations, some diseases are mistaken for it, and, what is more important for the patient, pulmonary tuberculosis has been mistaken for the other diseases. So in the diagnosis one should try to think of the diseases which simulate, or may simulate pulmonary tuberculosis.

TREATMENT

Prophylaxis.—This resolves mainly into two broad factors—namely (1) destruction of the specific germ and (2) increase in the resistance of the individual.

The specific organisms which are very resistant to ordinary means of disinfection are as a rule derived from patients who are suffering from this disease, specially of the lungs. While a person with open lesions in the lung coughs, he sprays fine particles of tubercle laden sputum at a distance of about a meter. The utensils, floor, bed and as a matter of fact almost everything coming in contact with the patient are likely to be infected, hence the great importance of complete isolation. This is again a disease in which, if young people are continuously exposed, are almost sure to be affected. Though there are numerous methods of checking this ever increasing menace, still the following few may possibly be suggested :—(1) local study of the prevalence and spread of this disease, (2) a list of resources that can be used to control it, (3) notification of cases to facilitate segregation, education, cleansing and renovation, (4) provision for dispensary facilities of early diagnosis and thus to check the spread of infection to others (5) provision for adequate number of hospital beds and sanatoria, (6) though preeminently an economic question, suitable protection and strengthening of all those directly exposed to the disease, (7) to enlist as much of public support as possible (8) educating the public on the importance of early diagnosis, segregation etc. To be of any appreciably effective type—the propaganda must be a national one, begining from the children at schools onwards.

It is mainly a house disease.. And as such the need for precautionary measure, against over-crowding and lack of ventilation and so on, should always be emphasised. *The disinfection of the sputum, is best done by burning it in fire, or by boiling it (sputum) for thirty minutes with suitable disinfectants.*

Rules to be followed by the patient.—The patient *should always hold a cloth, and not the palm, in front of*

the mouth while coughing or sneezing and so on. This cloth should not be used as a handkerchief but burnt down. He should be cleanly in his habits and fully alive to his duty to the public. Until this is realised, little effective prophylaxis can be accomplished. Beards and moustaches should be short, if kept at all. Kissing should be forbidden. The hands should be frequently washed and he should not touch any food intended for others. The space between the beds should be more than four to six feet. Due care need be taken for the untensils and other articles which may be smeared with tubercle bacilli, especially in an open case. *The floor shoud be only wet-cleansed by swabs soaked in five per cent carbolic lotion and never dry sweeping allowed.* The furniture and extra articles should, as far as possible, be taken away from the patients room. The sputum should be dealt with properly as suggested. It is not always safe to bury the sputum as it may percolate and find it way into sources of drinking water.

Individual Prophylaxis.—This really begins from the childhood, specially in weaker children. If a child is born of tuberculous mother, the latter should not nurse the child. Contact with the mother should be as scarce as possible. The child should be separated from the mother and all precautions to prevent infection adopted. The floor if used for the child's bed should be washable and daily cleansed carefully with antiseptic and by wet mops. The street-shoes should not be allowed into the nursery. The child should never be allowed inside the room of a consumptive except for a moment. Infancy is the period of greatest susceptibility. Tuberculin test may be helpful.

Gradually form the age of two to five years, the child should be given cool sponges, and allowed to sleep in a room having its doors and windows opened up, specially in the tropics. In the cooler countries and places, suitably cool but a well ventilated room should be his place of sleep at night. The hours spent out of doors should be lengthened in winter and as much as possible in the summer. He should be initiated to self-restraint and unselfish habits. These rules are important for susceptible children. They should preferably be brought up either in good country towns or in healthy suburbs. If during the school going age the child is not as strong as it should be as compared to his age, he should frequently be examined for the possible disease and his lung, tonsils, teeth, digestion and diet attened-ed to. Inspite of all these it is doubtful how far we can

protect these children. They should always be protected from all infectious diseases including measles, whooping cough, influenza and others. These by lowering body resis tance may flare up a dormant tuberculous infection. Gradually as he grows, the boy should be encouraged to participate in out-door sports, but never allowed to undertake these to the extent of over-exertion. Bad eaters require special care and attention, and any susceptible or exposed person who is in young age ten pounds or more below the optimum weight should be specially looked after in view of pulmonary tuberculosis.

During adolescence[9] the stress of more studies, increased physical strain and the worries of work for the poorer classes, mark out this period as important. All excesses, night-keeping, irregular meals, and anything which tends to lower the body resistance should be avoided at all costs, because it is during this age that most of the latent or preinfective cases turn into frank tuberculous subjects. Women of child-bearing age are more susceptible than elderly ladies[10]

Change to better climates, sea-voyage and mountain climates are suitable during adolescence. Then comes the choice of profession, the question of marriage, and so on. These need serious but judicious consideration. But to be able to undertake all these measures, there needs the ever important basis of economic affluence.

Curative Treatment.—

Curability.—Probably in no other chronic disease, as in pulmonary tuberculosis, success depends upon the skill and ability of the physician to regulate the life of the patient and thereby raise his body resistance, as it is on the latter that we have to depend for the ultimate cure of this long continued disease. For this the following points need emphasis.

(1) The great amenability of pulmonary tuberculosis to treatment specially at its earlier stages, hence the importance of an early diagnosis and prompt treatment. (2) Though the disease manifests itself locally in the lungs, yet it gains a foot-hold first by lowering the systemic resistance by superimposed infections like malaria, amoebiasis etc. hence the importance of increasing the resistance by all possible means. (3) Patients need more careful individualising in this disease, according to their economic, mental, physical, environmental,

9. Wingfield and Macpherson, (1936). Brit. Med. Jour. i, p. 741.
10. Burrell, (1936). Jour. of state Med. 44. p. 7.

occupational and other states than in any other disorder. (4) In most of these cases before actually begining treatment it is wise to explain to the patient, and if required to his guardian, the persistent nature of the disorder and of the indispensable necessity of earnest co-operation of the affected individual. A person who is clever, persevering with a determination to get cured, is far more likely to be all-right than a dull, apathetic or fussy or careless person, who by nature being without a stamina, is likely not to follow the tedious regime so long as he feels strong inspite of illness. The pecuniary condition of the patient is none the less important, specially for home treatment.

Even after arrest of the disease the patient must stick to the dietohygienic regime and a regulated life which led to the arrest of the pathological process. Though it is extremely difficult to give any idea as to the length of time required for the arrest of a particular case of pulmonary tuberculosis, yet generally it is not possible to get any appreciable results before two to six months, and it must be realised that the stage of the disease and the resistance of the individual are important guiding factors which determine this time limit. But unfortunately this is often too long a period to tire out the patience and even endurance of many, hence comes the difficulty in treating this protracted illness. There may be persons of certain families with inherent lowered tissue resistance to infection by mycobacterium tuberculosis. Infection in such subjects has naturally a gloomy prognosis.

Streptomycin in Tuberculosis[11].—

Very recently the report on hundred cases of tuberculosis of various types treated by streptomycin an antibiotic has been encouraging and the future outlook of treatment of this infection appears to have been changing for the better, and may prove one of therapy of choice in near future.

Nonsurgical Pulmonary Tuberculosis :—Out of 32, cases 21 were far advanced, 9 moderately advanced, 2 minimally advanced. Treatment was given for 2 to 6 months with a daily dose of streptomycin varying from 1 to 3 g. This total daily dose was divided into 4 to 6 equal doses and given intramuscularly or deep subcutaneously every 4 to 6 hourly. Result was *definite roentgenographic improvement in* 25, *patients*, despite unfavourable trends observed prior to treatment. *Evidence of closure of pulmonary cavity was observed in* 12 *patients, appearently as a result of treatment.*

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11. Hinshaw, Feldman, Pfuetze (1946 Nov. 30.) Jour. Am. Med. Ass. 132 p. 778.

Thick walled cavities in 6 patients persisted. *In 13 the tubercle bacilli disappeared from the sputum* while on treatment no case was worse, whereas discontinuation of treatment by streptomycin showed reactivation of disease in six cases.

In selection of patients with pulmonary lesion for streptomycin therapy "preference should be given to those patients with progressive disease who cannot be effectively treated by conventional methods. Priority also should be given to those patients whose disease appears to be of such a character that it might be brought under permanent control with a few months of suppressive treatment with or without surgical intervention." Other established methods of treatment by rest, good diet etc. should not be neglected.

Other types of tuberculous lesions like,—miliary tuberculosis, lesions of larynx, hypopharynx, trachea, bronchi, tuberculous fistulae, genitourinary tuberculosis, lesions of bones and joints, surgical tuberculosis of lung were all favourably influenced under streptomycin therapy, though for a period of two to six months in the above dosage and frequency.

This report shows so striking therapeutic efficacy under streptomycin therapy in such a serious disease as tuberculosis, that every one should try to read it in original.

Promin group a sulphone[12] with a big formula,[13] though gave very encouraging results in tuberculosis of G. pigs,[14] human trial did not appear so encouraging except in exudative cases,[15] usually given orally in 1.2 to 1.6 g doses daily for 4 to 6 months, along with the usual lines of rest, good diet, vitamins, open air life, collapse and other tried lines, which have stood the test of time. It may also be given by intravenous drip and inhalation nebulised as a fine spray and also locally as an application[16]. Extra-pulmonary lesions like tuberculosis of bones and joints and abdomen appear to be benefited. It causes certain toxic symptoms like haemolytic anaemia, mild cyanosis, head-ache, lassitude, restless-

12. Feldman, Hinshaw. (1943) J. Lancet 53 p.11 .
13. Editorial (1943) Jour. Am. Med. Ass. 121 p. 763.
14. Feldman, Man, and Hinshaw (1942) Am. Rev. Tuberculosis. 46. p. 187.
15. Hinshaw, Pfuetze, Feldman (1943) Ibid. 47. p. 26.
16. Heaf, Hurford et al (1943) Lancet, 1. p. 702.

ness etc. but they are controllable and reversible. *Promizole*[17] is also a similar sulphone. *Diasone*[18] another preparation has not been found useful.

In a recent critical review on chemotherapy of tuberculosis D'arcy Hart.(1946)[19] summarises the effects of sulphones "They exercise a deterrant effect on experimental tuberculosis, at least in some animal species, more than any previously tried chemotherapeutic agent; o o . In man the small numbers and the absence of simultaneously matched controls in most trials hitherto reported make assessment difficult, but the results appear nothing like as favourable as those in guinea-pigs etc." "In short it may be said that *promin* may not be of much use in pulmonary tuberculosis except in exudative forms." Local application may afford some result. But in the words of the pioneer workers on *sulphones* "no definite place has been found for these drugs in the treatment of usual types of tuberculosis."[20]

Rest should be absolute in all cases showing any temperature and increased pulse rate. It may be required that this period of absolute typhoid rest should extend even upto several months. As the temperature tends to be normal, notably in the evening, the patient should be allowed gradually to sit up first for a few minutes to be prolonged according to its effect on the temperature, pulse and so on. Gradually standing (erect posture) is allowed, and gentle walking of a few steps and so on. The type, duration and speed of these exercises should be regulated by the nature of the response the system makes as manifested mainly in the raised temperature or increased pulse rate and so on. If these indicate that too much of exercise is being taken, then more rest and less of exertion is to be advised. In short this graduated exercise should be just short of a febrile reaction and persistent increase of pulse rate. The main idea underlying is, to immunise the patient to the tuberculin liberated from his foci of infection, gradually and slowly, so that at least he may undertake his usual avocation without a febrile reaction and loss of weight. Thus in time the patient may be allowed to go out on a cautious drive. Ultimately graduated work with-

17. Feldman, Hinshaw et al. (1943. Jan. 26) Proc. staff. Meet. Mayo clin. 19. p. 33.
18. Corper and Cohn (1945. April, 12.) Jour. Am. Med. Ass. 127 p. 1043.
19. Brit. Med. Jour. (1946. Dec. 7.) p. 849.
20. Hinshaw and Feldman (1945) Bull. Nat. Tuber. Ass. U.S.A. 31. p. 151.

out causing a temperature and acceleration of pulse rate and loss of weight may make him fit to carry on his occupation. Needless to say that the less strenuous the occupation is, the better is his chance of remaining well.

Fresh air and open, outdoor life.—Fresh air has long been regarded as an essential part of the treatment of pulmonary tuberculosis. Persons having outdoor occupation of a healthy type, are generally found to be robust and it is also known that fresh air tends to make a man healthy and his general systemic resistance improves,[21] and the susceptibility to cold and catarrhal infections decreases too. This scientific truth is utilised to bring about a cure of the tuberculous subjects. But here too moderation, caution and judgment should guide us. According to Philip (1931)[22] "this is the foundation on which all other procedures should rest. In proportion as this is sufficient, every thing else becomes easier." The patient should be given as much of fresh air as possible, consistent with his general health and state of disease.

Whereas according to Burrell[23] (1936) it is wrong to have widely opened windows in all weathers, fog, wind, rain or snow etc.

But one should always exercise common-sense and see that chilling is avoided. Suitably sheltered open spaces—say under the shade of trees or protected varandahs are quite suitable for most cases, specially when the weather is fair. House tops are very good all the year round if arrangement is made for protection against inclement weather. The patient should be lying on a bed, if febrile all the while, gradually as the fever becomes less he may be allowed to sit on a camp chair, reclined for a few minutes to be prolonged gradually. At night sleeping under a proper shelter with no blockage or very little blockage to free flow of fresh air is quite suitable. When the patient cannot but be inside the room, all the doors and windows should be kept open day and night. In the mud build thatched cottages of the poorer people, the varandah may be utilised for this purpose, with temporary protections devised for the rains. During the winter months except where the cold is very freezing at night the patient may be made to get used to lie in the varandah day and night. Cold or hot blasts of wind may be prevented from reaching the patient by proper clothing or barriers or protection. But the average room in the mud built house or the rooms of brick built houses of middle class people, are

21. Morland, (1936). Brit. Jour. Tuberc. 30: p. 142.

not generally suitable for fresh air treatment, a very important adjunct in the cure of this protracted scourge.

Diet and infection.—Thin persons are more likely to contract tuberculosis than stouter ones. When there is shortage of food generally the incidence of tuberculosis increases, this was very strikingly demonstrated during the last Great war. Specially shortage of animal fat in the diet tends to predispose to tuberculous infection. Weak digestive power, and not uncommonly loss of appetite are common in tuberculosis, but generally, when instead of the indoor life the patient is given an open fresh air regime, very ably expressed in the analogy[22]—"as soon as they are planted from the hot house of indoor treatment to the open graden of free air and light," the appetite returns more or less quickly and there is an appreciable improvement in digestion and assimilition. To increase appetite, the alkaline bitter mixture with soda-bicarb and gentian etc. given an hour before the principal meals followed by hydrochloric acid and pepsin as in cases of dyspepsia, may be of definite service.

Diet—Should be nutritious and at the same time easily digestible, the cooking good and the service attractive. Serving the meals in the open air is often an agreeable change.

Breakfast.—Consisting of oatmeal porridge or fried rice or paddy—(Muri or Khoi or Chipitok;) with milk, banana, sweetened with molasses—instead of sugar, two eggs, some buttered bread or butter and sugar-candy in the absence of loaf or chapati, some fresh fruits, whatever available, even tomatoes, are of use. Vitamin C not only keeps the tone and nutrition of the endothelium of the blood vessels but it also helps in the regeneration of new fine capillaries, thus helping quick cure of lesions. Lipase content of blood increases under C vitamin therapy.

Butter, one to two ounces or one-fourth to half a chittack, one glass of milk, two eggs, some fruit juice, milk, banana and rice boiled or fried, or oatmeal porridge, with sugar, are suitable for those who can afford. For the comparatively poorer people some germinating grams with ginger, a cup of milk, one egg, or milk and fried paddy or rice (chipitok or khoi or muri) with banana and molasses are suitable. If the

22. Philip, (1931). Index of treatment by various writers, Edited by Hutchison. p. 727. 10th Edition. Wright; Bristol.
23. Burrell, (1936). Ibid. p. 721. 11th Edition—January 1936.

patient cannot afford fruit, tomatoes, three to four of the average size ones may take the place of fruits. Some suitably grown green vegetables such as "Palon Shak", "Lettuce" or the soft central portion of cabbages may be taken raw, with tomatoes sliced, having small amount of sugar and salt added to taste. Some add small amount of juice of a lemon to this. Salad, to which raw onions may be sliced and added, is liked by many. Such salad preferably should be taken either with the lunch or two hours after the breakfast of milk and eggs. The salad might, due to its acid content, interfere with the absorption of calcium hence the suggestion of taking it separately from milk, eggs etc.

'*Papita*', (Papaya) '*bael*', mangoes, apples, bananas, oranges, custard apples, berries, tomatoes, cucumber, germinating grams, all or separately, in small portions, salads should always be partaken of, during the day time. Taken at night they may give rise to abdominal discomfort. Unless the salad is properly made after thorough washing of the vegetables there may be a risk of infection of the intestinal tracts by typhoid group of organisms.

Noon meal or Luncheon. The noon meal may consist of all proximate principles of diet, provided it is nutritious and easily assimilable. For those who like and can afford—a soup with some butter or suitable animal fat floated on it, specially during the winter, bread and butter, or rice, not overmilled, hot, with as much butter as the patient can digest and afford, or 'chapati', or 'puri' made of dependable wholemeal, the former being smeared with ghee, or clarified butter, some lentil (dal) cooked with butter, vegetables, fish, meat, egg, prepared according to the taste, appetite and digestive power of the individual, are of use. For the vegetarian, suitable dishes may be prepared. Milk preparations with sweet like '*sandesh*' or '*poromanna*', custard etc. or similar preparations are liked by many. The fresh leafy vegetables are important sources of mineral salts and if properly digested have efficacy almost equalling that of milk. The *afternoon tea* should consist of almost the same items as chosen for breakfast, but variety, taste and liking of the patient should always have due consideration.

The Night meal or Dinner. This should better be taken by seven to eight in the evening, consisting of almost the same constituents as partaken of in the noon meal, but here again some milk preparation, egg, butter and sweets are included in the dietary with advantage. But very heavy dinners specially when taken late, are not quite suitable for

patients with weak constitution. The scale of diet should be built up gradually and by steps otherwise there is risk of causing digestive trouble.

The diet should not only be rich in mineral matters and vitamins but also should contain all the proximate principles, preferably in something like the following proportion, proteins 90 g., fat 160 g., carbohydrate 220 to 250 g.

In all these cases, where the digestive capacity permits, *extra ration* in the form of a cup of sweetened milk, in between the principal meals, should be insisted and that generally to the advantage of the patient. Gradually the quantity is to the increased specially of milk, eggs, butter, fruits etc.

In short to sum up—one should stress on the intake of one to two eggs, one to two seers or two to four pounds of milk, butter one to two ounces, or one-fourth to half a *chittak* and some fresh fruits, meat and fish with carbohydrates, green vegetables etc., daily. Cheese and cream are important articles of diet for these cases, and should be given wherever possible.

Extra diet.—Addition of good *cod-liver oil* or shark liver oil, (Calicut Govt factory) to the ordinary diet, or along with milk, beginning from one to two teaspoonfuls, twice daily, stirred up in the cup of milk, increased upto four to eight teaspoonfuls may be of good service. As most persons suffering from tuberculosis are thin and require fattening, this course of easily digestible fat, rich in A and D vitamin is a valuable addition to the dietary.

Most subjects of tuberculous infection find *pure milk* unsuitable, and often it produces gas and abdominal discomfort. In such cases if milk is boiled with any cereal as barley or sago or rice or flour, and given to the patient, this discomfort is generally overcome. Even when milk is condensed to a thicker consistency, strangely it also agrees with most of the patients. These practical points are worth remembering. When milk produces diarrhoea or loose stools, soured milk (dahi) or casein (channa) may take its place. Cheese and cream are valuable additions in the list of ordinary dietary.

Vitamins.—Plenty of A and D vitamin is found to be of service, the former for its anti-infective and the latter for its blood calcium and phosphorous balancing properties, besides their other usefulness. Codliver oil may not be assimilated by patients with weak digestive power. In

these cases some form of halibut oil or other preperations of vitamin concentrate such as haliverol, adxolin, vitadex, navitol etc., are useful. Plenty of C vitamin appears to be of use too.[24] Malt combination with these vitamins and iron are valuable in the treatment of all chronic wasting diseases, best examples are ferradol, irrado-malt etc. They sometimes help in rapid regaining of body weight.

Calcium.—Workers in lime are generally free from tuberculosis. Though there is not much scientific basis for its use except that we do find at times some effect on the range of the temperature of the tuberculous patient after injections of calcium, yet it is used extensively. According to Mac Callum[24] (1924). "Serum contains calcium and inorganic phosphorous in solution in much higher concentration than would be possible in water on account of the high carbon-dioxide tension and the contained proteins. This is true in intercellular fluids where the carbon-dioxide tension is high on acount of cellular activity. When the carbon dioxide tension is low because the tissue is inactive or dead, conditions are favourable for precipitation." Hence may it be very unlikely, that calcium, when in excess in the blood, gets precipitated round the dead necrosed or dying tubercles, where the lowered or absent cellular activity favours calcification around them? However, this is how nature isolates and walls up the diseased foci of tuberculous lesion. Calcium may be exhibited in the form of injections of *gluconate*, intramuscularly or per vein. Generally the ten per cent solution beginning from two c.cm. upto ten c.cm. twice a week is advocated. *Calcium chloride* is given in above dosage and interval but generally is started initially from five per cent worked upto ten per cent. It is to be given only intravenously very slowly as intramuscular injections of calcium chloride cause extensive necrosis. Even while giving intravenously if one drop leaks into the subcutaneous tissues, necrotic ulcer is almost sure to follow, hence it is now more or less in disuse. D vitamin[25,26] with parathyroid in 1/10 to 1/4 grain doses with calcium, given orally, is likely to raise the calcium level of blood. There are several such

24. A text book of pathology, (1924). p. 111; Third edition. Saunders Publication. Scholz (1945 Aug.) Am. Rev. Tuberculosis. p-27.
25. Hunter and Aub, (1927). Quart. Jour. Med. 20: p. 123
26. Gordon, Roark and Lewis, (1926). Jour. Amer. Med. Assoc. 86: p. 1683.

preparations in the market. Some prefer to inject colloid calcium with vitamin D in one to two c.cm. doses twice or thrice a week. Only the dependable preparations are safe to be used for this purpose. Calcium, pancreatin, lactopeptin and takadiastase in five to eight grain doses each, with cryogenin in two or four grains, in febrile cases, thrice daily after meals, may be used with good effect. Vitamin K is also of use, specially in presence of liver trouble, jaundice, particularly in haemoptysis.

Iodine.—Nascent iodine was in vogue for some time, but it appears to be of doubtful value.

Creosote and its derivatives.—Pure beechwood creosote, given in one to five minims in capsules or in emulsion is advocated by many. But it upsets the digestion and is often contraindicated. Thiocol or Styracol (potassium guaiacol sulphonate) in four to ten grains thrice daily may be used with advantages of creosote, but without its disadvantage. These preparations appear not so much in use nowadays as was in former days. They are indicated in chronic disease with bronchitis or bronchiectasis with foul smelling suptum etc.

Arsenic:—According to old French Workers, arsenic is a valuable remedy in tuberculosis of the lungs. It may be given in three to six minims of liquor arsenicalis twice daily after food, or injections of sodium cacodylate in half to three fourth of a grain subcutaneously, daily, till ten to fourteen such are given. This is again repeated after three weeks. The liquor arsenicalis should be continued for at least two to three months. It is a valuable alterative and increases tissue resistance to all chronic infections.

Sanatoria. These are generally located in specially selected places, where subjects of tuberculosis are likely to be benefited. The patients have the advantage of being under the careful supervision of doctors with much experience in the line. The strictly regulated life in these institutions helps in the building up of quick defence. The bracing climatic conditions in which these sanatoria are situated help by increasing appetite and better assimilation, and thus quickly builds up resistance.

But the modern tendency is not to stress so much on the nature of the country and its climatic conditions, because, we are gradually learning that much might be done in all average places, provided the conditions permit abundance of fresh air, and observance of the common items of physio-

logical principles. It would be rash and foolish to deny the salutary influence of good climate on a case of pulmonary tuberculosis. But for an average person, this means expenses, not uncommonly beyond his means. If the financial strain is too much for him to bear, through anxiety and mental strain improvement is not likely to be as satisfactory as was expected. When a case is sent to a sanatorium, the first question should be,—is he fit to undergo that strain of the journey? Would he be able to stand the change in climatic condition? Pyrexial cases while being sent need special consideration. Late or too advanced cases are not likely to be benefited much by a change to a sanatorium.

When the patient improves, graduated exercise is given to him so that when he reverts to normal life, he can carry on his usual avocation without difficulty. But unfortunately one has seen cases, who have become febrile after they have reverted to their normal life. *A course of tuberculin injections* to abolish this sensitivity or the state of allergy, previous to the patient's resumption of work, is advised with reasons, notably to prevent a breakdown.

Selection of climate.—According to many including Burrell "tuberculosis is a disease of all countries and climate plays but a small part in its treatment". In choosing a sanatorium the condition of the patient as a whole is of greater importance than the disease. But the state of illness also need consideration, in selecting place for the change.

Sea side. These places are suitable for persons with a weak circulation, or having chronic bronchitis, asthma, or a tendency towards catarrh or albuminuria. Particularly suitable cases are those of glandular, joint and bone lesions caused by tuberculous infection.

Sea voyage,—has all the advantages of a seaside climate with the additional benefit of a pure fresh air and sun light. But one should spend the minimum time on the cabins.

Mountain climates. Generally climate with high altitude is utilised for sanatoria. The advantages are, great purity, dryness, coolness, brilliance and warmth of the sun's rays with quiet and stillness of the atmosphere. These all make great impression on the patient's mind and the body. Though variable in effect, it stimulates not only circulation and respiration ,but also helps in the regeneration of blood, improves appetite and digestion, promotes healthy secretary activity of the skin and so on.

These places are suitable for all types of cases except those having tendencies to chronic bronchitis, asthma, enteritis, albuminuria, etc. Cases should better be sent to these higher altitudes while they are in the acute exacerbations. Availibility of good and abundant food is an important factor in choosing these places out.

Forest and Woodlands. These places with relatively slight or no elevation are suitable for most types of cases. Even progressive ones derive some, often, much benefit, therefrom.

But it need be remembered that though these places possess certain peculiar advantages by their stimulating action on the various systems of the human body, yet the most important items of treatment, namely abundance of pure fresh air, with an active sun, plenty of good food, proper rest and graduated exercise, according to indication, are the principal factors in bringing about a cure.

Tuberculin. It is a very extensively tried remedy which gave varying results in the hands of different individuals. Some of the important causes of lack of success may be traced to :-

(1) Improper selection of cases.

(2) Want of patience on the part of the affected and lack of experience of the doctor.

(3) Sometimes, the hasty and reckless methods of employment of this highly delicate remedy and several other minor factors.

But the recent idea is, that tuberculin has a limited field in the treatment of tuberculosis.

Indication etc. It generally aims at causing tolerance or desensitisation, and not exactly, at immunity. The reactions after injection, as in vaccine, are local, focal and general.

In short the proper cases are those in whom the disease is localised and the systemic disturbances slight. To be of any benefit the defence mechanism of the patient must be capable of a response, hence in cases where the disease is already systemic with more or less marked toxaemia, tuberculin treatment is contra-indicated. Patients rendered afebrile, after a judicious dietohygienic regime are generally suitable for tuberculin treatment, and it may help to reduce chronicity. It may also be used in early closed cases or in apparently healthy but suspected persons in tuberculous

famlies, to raise their tolerance to the toxins. Children do well under it too. In former days, and in places where artificial pneumothorax treatment was not possible, but sufficient rest did not render them completely afebrile, tuberculin was tried, but need be started from very minute doses. It is probably unwise to administer tuberculin in cases whose minimum temperature does come down at the height of the febrile bout to 99°F or below.

Frank contraindications are,—rapid loss of flesh, malnutrition of later stages, supervention of meningitis, miliary tuberculosis, nephritis, epilepsy, pronounced nervousness and tachycardia with pulse rate above one hundred per minute.

Types of tuberculin in short are. Koch's old tuberculin, consisting of bacilli of bovine type called P. T., or of bacilli of human type called T.O., bacilliary emulsion or B.E.; B.C.G. consisting of living bacilli attenuated by repeated subculture to such an extent that they become non-pathogenic. Now it is more or less agreed that old tuberculin is mainly used for testing, some from of B.E. for treatment, and B.C.G. for prevention.

The details of these products.—

Those containing exotoxin. Koch's old tuberculin, T. (if of bovine origin P.T.) is a glycerine extract obtained from recent six to eight weeks' old broth culture of bovine tubercle bacilli, concentrated to one tenth the volume by slow evaporation. The usual initial dose though much variable, is stated generally to be 0.00001 c.cm. diluted with normal saline containing 0.5 per cent carbolic acid as a preservative.

Tuberculin T.O.—or if from bacilli of the bovine type, is essentially akin to the above. Only difference is that this extract is not concentrated by evaporation. Hence being a milder preparation the usual initial dose is 0.0001 c.cm

Denys's tuberculin, is a simple filtrate obtained by passing tubercle culture through porcelain filters. The initial dose is similar to that of T.O.

Those containing endotoxin,—tuberculin T.R. is an extract from recent cultures, dried in vacuo and pounded in a mortar, the more soluble exotoxins are removed before extraction. The initial usual dose is 0.00001 c.cm.

Bacillary emulsion (B.E.) is an emulsion of dried, powdered tubercle bacilli in equal parts of water and glycerine. The initial average dose is 0.0001 c.cm.

B. C. G.[27] (Baecill-Calmette-Guerin) is made of attenuated bovine tubercle bacilli, produced by subculturing on potato-glycerin and bile over a period of years. This is mainly used as a preventive and many thousands of children have been injected resulting in successsful prevention. Though there are cases reported in which a few acute attacks of tuberculosis might have been traced to the use of B. C. G. tubercle vaccine, yet they were almost surely not due to the vaccine itself, but to some contamination. This vaccine is being used extensively lately with very encouraging results.

Dosage of tuberculin. It should be so chosen that only a slight, just detectable reaction is elicited. Within the first twenty-four hours there is slight malaise and quickening of pulse with little rise of temperature. The symptoms such as cough etc., and other physical signs too may be more pronounced, after the injection of tuberculin.

In actual treatment it is generally advisable to begin from a subminimal dose and work upto the optimum one. Watch should be kept on the development of hyper-sensitivity. In short the interval and the amount should be determined by the reaction shown which may be either, local, focal and general or systemic. It is often judicious to repeat the initial two to three doses just short of a marked reaction.

Duration.—The course may extend upto six months or longer. An interval of three to six months is preferably given between the two courses. The second one is generally of a shorter duration than the first one. The next one may be shorter still.

Hyper-sensitivity,—may rarely develop in the course of treatment, here smaller doses short of evoking sensitivity should be tried, and the interval lengthened.

Tuberculosis dispensaries. Clinics in the out-patients departments of hospitals may be utilised for these purposes.

Chemotherapy.—

Gold preparations. Sanocrysin, thiosulphate of gold and sodium (Mollgaard 1923) is used. There are numerous other gold preparations, some of the important ones are mentioned below. They act by stimulation of the defensive

27. Kereszturi and Park, (1936). Amer. Rev. of Tuberc. 34: p. 437.

forces of the body and promote fibrosis and appear to have no direct action on the bacilli.

Indications. The chief indications of gold treatment of pulmonary tuberculosis are :—1. Acute[28] spread of disease when the lung cannot be collapsed by pneumothorax, 2. in conjunction with artificial pneumothorax in bilateral disease, 3. persistence of tubercle bacilli in the sputum, 4. steady spread of the disease in fibrocaseous cases inspite of other treatment, 5. to check occasional exacerbations inherent in all chronic cases of tuberculosis of the lung, 6. in slowly progressive disease, which do not improve under ordinary methods of treatment.

Myocrisin (May and Baker) is chemically sodium auro-thiomalate for intramuscular injections. It is available in watery solution, also in oily suspension. Though the watery solution is easier to administer the oily suspension warmed in hot water and well shaken may be given through a stout bore needle, sometimes with slight difficulty, yet the latter appears preferable, because some of my patients complain of sensation of warmth and occasionally uneasiness immediately following the intramuscular injection of the watery solution given almost invariably in the gluteus with care specially for safety. Combined myocrisin and artificial pneumothorax therapy appears to afford satisfactory results in suitable cases. The usual doses supplied are 0.01, 0.02, 0.05, 0.1 gm respectively in separate ampoules.

Solganol and Solganol Boleosum (Schering). This oily suspension was given intramuscularly in quite a large number of cases, after the ampoule has been warmed and shaken well. These (solganol and myocrisin) have given satisfactory results in our cases. The supplied dosage is 0.01, 0.02. 0.05, 0.1, 0.2, 0.3, 0.4 g respectively in separate ampoules each.

Dosage etc.—

Both the above preparations—should preferably be given in the gluteus muscle. Upto 0.05 dose one may give every 3rd to 4th days but from 0.1 g upwards it is advisable to give only once a week and not more frequently. The total dose need not exceed two grams for an adult. The larger total dosage advocated formerly appear unnecessary and even may be risky in some cases. *The second course if indicated need not be repeated earlier than three months*

28. Graveson, (1930). Tubercle. 11 : p. 193. Mansell, (1932). Lancet ii : p. 837.

after the first course is over, because gold takes months to be completely excreted out of the system. Some workers advocate six months interval.

The results of this treatment were that the patients felt better though a temporary decrease in weight was not uncommon. The temperature also increased in some, often temporarily. The sputum was reduced in quantity and contained lesser bacilli.

If carefully employed, specially in early exudative or fibrocaseous cases, it is an adjunct to the dieto-hygienic and collapse therapy. In very advanced cases it is generally useless, probably because the power of the system to build up defence is lost.

Some of the *complications of gold* treatment. They are 1. *Febrile reaction*—which may last only a few hours, and be accompained by shivering etc. In some cases may extend to three to five days, rarely to a fortnight. 2. *Dermatitis,* this may range from mild urticaria to oxfoliative dermatitis of a serious nature. Best treated by preventive measures—such as starting from an initially small dose dissolved in calcium gluconate solution, also by alternate injections of contramine and calcium thiosulphate etc. Bright light specially the sun's rays and ultraviolet exposure should strictly be avoided. 3. *Albuminuria*—is very common following injections, and as a rule disappears in a day or two. If it persists even when the dose is reduced the treatment should be suspended. With moderate doses given along with calcium gluconate solution nephiritis is very unlikely. 4. *Gastro-intestinal* symptoms are those of poisoning by heavy metals, such as stomatitis, metallic taste in the mouth, and when inspite of those warnings the drug is pushed, diarrhoea and vomiting may occur. 5. *Arthralgia* is not uncommon. The management followed above for other complications ameliorates this condition.

Increased tolerance to Gold intramuscularly.—Oral administration of dram doses of calcium gluconate thrice daily or injections of calcium gluconate to increase the tolerance for this drug should be given, when a total of more than two grams is to be pushed, notably during the later part of the treatment. It is claimed to cause less toxicity. But equally competent authorites hold that it has very little advantage over the watery solution[29]. Personally one has

29. Burrell, (1936). Index of treatment, edited by Hutchison. p. 724.

used this preparation in about twenty cases and the result appears encouraging.

Antidotes to Poisoning symptoms are C vitamin calcium and liver extract injections.

SPECIAL FORMS OF TREATMENT

Artificial pneumothorax[30].—This method of giving focal rest by collapsing the lungs is comparable to the application of a splint on a tuberculous joint. As in all other forms of treatment this method should be instituted early and should not be looked upon as the last resort after all other kinds have failed. Artificial pneumothorax is called A. P. for brevity.

Indications.—According to Bronfin, (Denver—1933.)[31] there are generally four absolute and provisional indications each for artifical pneumothorax.

Absolute.—In (1) extensive unilateral exudative or fibrocaseous pulmonary tuberculosis, with or without cavitation and positive finding in the sputum, (2) chronic unilateral fibro-ulcerative tuberculosis of the lungs,(3) profuse haemoptysis or recurrence of pulmonary bleeding, provided the site of haemorrhage is suspected rightly, (4) acute pneumonic tuberculosis of one lung.

Provisional.—(1) Bilateral disease with single or multiple cavitation of one side and the general condition of the patient is good. The contra-lateral side is not of the type of pneumonic tuberculosis; (2) bilateral disease, with numerous cavities in one, and a single one or none on the other, in both these the worse lung should be collapsed first. Bilateral pneumothorax is justified, but this should be undertaken with great care and caution; (3) in cases of chronic fibro-caseous disease, of one lung, and more recent acute disease in the other, rest therapy failing, the recently infected one is collapsed first. After one year or so the question of collapsing the chronically infected lung should be thought of. *Alternating pneumothorax*.—Collapse of a newly involved lung is permissible in a patient otherwise suitable for such treatment, if the acute condition has developed during the process of treatment by artificial pneumothorax. The patient may be ambulant[32] while undergoing such treatment, particularly in suitable cases.

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30. Cuter, (1936). Jour. Amer. Med. Assoc. 106 : p. 1936.
31. Ann. Int. Med. October 1933. 7 : p. 468.
32. Jour. of Thora. Surgery. Dec. 1933. 3 : p. 175.

Some conditions—where good results are not obtained. [33] —(1) In cases of pleural adhesion; (2) thick walled cavities are difficult to be collapsed and, (3) broad bands of adhesion remain between the layers of pleura.

A few contraindications.—(1) If the lesion is healing under simple rest and medicinal treatment and the patient can afford to take such prolonged treatment. This is not exactly a contra-indication; (2) in very advanced cases pneumothorax should not be done as the last resort (3) If there is much fibrosis, thoracoplasty is usually more suitable. A good thoracoplasty is better than a bad pneumothorax. (4) patients over fifty years as a rule do better with simple treatment. (5) In the presence of other intercurrent but serious diseased processes as asthma and chronic bronchitis, A. P., treatment is not suitable. *Diabetes* is not a contra-indication unless it is very grave. Many persons keep fair health with proper doses of insulin and on artificial pneumothorax therapy.

Some other conditions not necessarily tuberculous well treated by A. P.—(1) Bronchiectasis cases are likely to improve by A. P. treatment before adhesions have formed. (2) Interlobar empyema and localised pulmonary abscess, are also sometimes very successfully treated by A. P. (3) In pleural effusion, the fluid may have to be withdrawn and replaced by air.

A few points.—Though there is difference of opinion as to whether artificial pneumothorax should be started in early cases, yet if average rest and dieto-hygienic regime of a month or two do not produce the desired results, serious consideration should be given to the induction of A. P. Because, if unduely delayed there may develop adhesions interfering with the ideal collapse of lung.

It should be clearly stressed that though this method does not entail much danger, and serious complications are rare, yet they do certainly exist. In acute rapidly spreading cases the sooner A. P. is induced the better is the outlook. Experience and judgement are important factors in deciding the suitableness of a particular case. But generally pneumothorax is induced too late than early. It appears judicious to decide in its favour whenever there is doubt as to whether it should or should not be induced in a particular case.

33. Amer. year book of General Medicine, 1934: p. 261.

The method.—There are numerous apparatus of which Lillingston and Pearson model is quite suitable, and simple. It may be used both for introduction and withdrawal of air.

A skiagram of the chest should be carefully scrutinized before the operation is actually undertaken.

Apparatus.—The apparatus is properly sterilised, made ready and kept by the side of the patient.

The patient.—The patient should be lying in bed, and preferably a mild purgative given during the previous night. Half an hour before the operation, an injection of morphine in 1/4 gr. to 1/6 gr. with atropine 1/100 to 1/200 gr., not only allays the nervousness, but also makes him stand the operation well and prevents shock. The patient should be resting on the scapula of the healthy side with the affected lung upwards, and better not after a full meal. The arm of the affected side should be kept above the head. A pillow may have to be placed below the dependent shoulder to widen the intercostal spaces on the affected upper half of the chest. The best site for primary induction is generally in the sixth space in the anterior axiliary line. The skin over this area is painted with iodine and sterile towels placed on the bed-clothes and against the chest.

The actual operation.—A few c.cm. of a two per cent novocaine solution is introduced for the purpose of locally anaesthetising the part. The skin over the sixth intercostal space is held stretched by the surgically cleansed fingers of left hand and the needle introduced obliquely to insert a few drops of the local anaesthetic to raise a bleb. After allowing time for the anaesthetic action of the drug to take effect, the needle is inserted at right angles to the chest wall, and gradually pushed through the intercostal space, above the upper margin of the lower rib, thus avoiding the intercostal vessels and nerves. As the needle is pushed on the contents of the syringe are also spirted out, care being taken to anaesthetise the pleura completely and cautiously. The patient should be warned against coughing during the actual operation. If the desire for cough is irresistible, he should raise the free hand kept over the head and warn the doctor, otherwise a sudden increase of intrapleural pressure in the process of coughing, with the needle therein, will drive the fluid out of the manometer. This can be prevented by pressing hard the tube of connection with the apparatus by the fingers, so that while the patient coughs the impulse is prevented from being transmitted to the manometer.

Now the blunt primary induction needle (Clive Riviere needle) which is kept duly sterilised, fitted up and the instrument is tested, under sterile water to see if it is in proper working order. The needle with the trocar is pushed through anaesthetised spot on the chest, the back should rest against the middle of the palm and should not be held as one holds the pen. The trocar is now withdrawn and the stopcock turned on so that the lumen of the needle is in communication with the tube leading to the manometer. The canula is gradually pushed down the remainder of the intercostal muscle upto the pleura. When the pleural surface is reached a small amount of oscillation may be noted in the manometer. The canula is now pushed through and the pleura is felt to give way with a snap. Care must be taken not to pierce the lung. When the canula is in the interpleural space there are oscillations in the manometer synchronous with the respiratory movements. A high negative pressure is generally indicative of a good result in the operation. The oscillations should be near about 6 to 10 c.cm. Thus when a reading in an actual case is —10, —2, a mean negative pressure of 6 c.cm. of water is got. Though during deep respiratory excursion the oscillations are greater yet the reading should be taken after an average respiratory movement. If no oscillation, indicating either blockage of the needle etc., takes pace, the canula may have to be cleared by the stilette supplied with the needle No. 1. When contact of the visceral layer of the pleura is at the root of the blockage, either withdrawal of the needle half a centimeter or letting in a little air locally will clear up the difficulty, and oscillations hitherto absent, will appear. Once one is sure that the canula is in the pleural cavity, air should be admitted. After about 100 c.cm. of air has gone in, only by the suction action of the negative pressure in the pleural cavity, to introduce more air the bottle may have to be raised to a higher level by placing it on a few books. After the introduction of near about 200 c.cm. the connection with the bottles to the manometer is closed, and the final intra-pleural pressure is read out. If it is now—8 and —1, then the final mean pressure after the introduction of the air is—4.5. It is entered in the record as follows :—8, 200 c.cm.—4.5. When air is flowing into the pleural cavity it is not possible to take a final reading. The needle is now withdrawn and the punctured area grasped between the two fingers so that the opening is closed. Touching with tincture iodine and finally sealing the puncture with either collodian or tincture benzoin com-

pound are all that is required. If there is a tendency towards cough, a large sterile pad and a firm binder are to be applied. The patient should preferably be in bed during the first few weeks of pneumothorax treatment.

The *manometer is the heart of the instrument and always air should be given under negative mean pressure and never under a positive one, as it displaces the midiastinal contents.*[34] The lung should be skiagraphed after the primary induction to see the degree, type and the site of collapse. The greater the mean negative pressure the better is likely to be the collapse by this method. A slight mean negative pressure may indicate adhesion or a small limited area of intra-pleural space and so on.

Refills.—These are given with the same apparatus, but the other pointed needle (Saugman) is used. The patient is prepared as before, but a preliminary injection of morphine atropine is not usually necessary unless he is very nervous. Now again in the same way another 300 to 500 c.cm. of air are introduced and the data entered into the records.

The *interval of refills* is generally two days between the primary and the first one, then three days, after the second, gradually lengthened to a week, ten days, a fortnight, three weeks and a month.

Temperature. In case there is slight fever after the primary A. P., the next refill should not be given the next day but one should wait till the temperature comes down. *Any rise of temperature just before a refill is due, generally indicates that the interval between them (refills) has been unduly prolonged, and the lung is beginning to reexpand.*[35] A rise of temperature after a refill indicates that probably too much of air is being introduced. A skiagram should always control and guide the physician, notably when in doubt. As suggested already, *under no circumstances air should be introduced when there is any positive pressure indicated in the manometer.*

Difficulty. There may be difficulty when the needle pierces the lung or enters a bronchus, or a small cavity, or a blood vessel, or a loculated inter-pleural space. Uuder such circumstances the canula may be cleared by the stilette or it may have to be withdrawn to be re-inserted at a neighbouring spot.

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34. Burrell and Garden, (1922). Lancet ii, p. 861.
35. Burrell, (1924). Brit. Med. Jour. i, p. 368.

Complications.—Some of the complications are *pleural shock,* surgical emphysema, gas embolus, effusion which may even be infected resulting in empyema etc. These should be dealt with, in proper lines. Pleural shock is prevented by adequately anaesthetising the pleura, surgical emphysema, by sealing of the puncture, tight pad and bandaging. Gas embolus is rare when careful puncturing is done. The simple effusion is left alone and careful primary A.P. or refills may not induce an effusion. I know a case where pleural shock killed the patient.

The result of A. P. Treatment. Here one quotes Burrell's figures given in 'Index of Treatment' by him[29] (page 731), "Thus in a series or cases of pulmonary tuberculosis treated by the author (Burrell) between 1918 and 1925 were followed upto 1934 so that the length of time since the start of treatment, varied from sixteen to nine years. Of 132 unilateral cases, 71 (53.7 per cent) were at work and 56 (42.4 per cent) were dead. Of 45 cases where there was slight activity in the better lung was involved 2 (4.4 per cent) were at work and 42 (93.3 per cent) were dead. It must be remembered that in none of these cases was artificial pneumothorax started until it was found that the patient was not responding to simple medicinal treatment. None of them was called a good case, that is to say, a patient with slight disease, who responded at once to treatment. In view of this, the result of 53.7 per cent working after a period of at least nine years is satisfactory. If, therefore, pneumothorax is started whilst the disease is still unilateral, it will offer a 50 per cent cure even if one does not include the large group of cases which become cured by simple medical treatment and which swell the percentage of cures in any sanatorium, especially if it admits only those who are apyrexial and in the early stages of the disease."

The results of bilateral cases are not encouraging. One should wait for a number of years before the results could be assessed, as the disease may flare up even after years.

How does artificial pneumothorax act beneficially.—

Coryllos[36] (1933) showed that tubercle bacilli require three times as much of oxygen, weight for weight, as compared with a normal muscle structure, hence when the lung is collapsed they cannot live under partial anaerobic conditions. Rest of the local tissues favours fibrosis. The bronchus and the blood vessels being kinked or obstructed, the

36. Jour. Amer. Med. Assoc. 18th Feb., 1933. p. 480.

air of the part is absorbed, and atelectasis of the area occur resulting in recovery by fibrosis and walling up of the dead rigid tissues. Unless the bronchus is kinked or obstructed the results of A. P. are not so satisfactory. There are also other ways by which it acts, such as partial obstruction to the flow of blood in the affected area, due to kinking and so on.

Extra pleural Pneumothorax.—(Nissen) was being practised recently. But Nissen (1939)[37] is of opinion that "thracoplasty and its various modifications and plombage are superior to extrapleural pneumothorax."

Oleothorax. Though of very limited use the following are its important indications.[38] (1) Though not an absolute indication, yet it is done, in nervous patients dreading refills or when he is in a out of the way place whence he cannot come regularly for treatment. But here too the patient should be under observation of a doctor, because if effusion takes place, the positive pressure will give rise to distressing symptoms.

(2) If due to contraction of adhesions the pneumothorax becomes closed, and one desires to delay the process of obliteration. Here too thoracoplasty may have to be done ultimately.

(3) In case of recurrent pleural effusion, complicating artificial pneumothorax treatment.

(4) To replace tuberculous empyema, this measure, though not ideal, is often used preparatory to thoracoplasty.

(5) In rare cases of very mobile midiastinum preventing a suitable collapse of the lung.

The oil used though varies, yet generally, *a five per cent solution of gomenol in olive oil is used.* Some use ninety-four parts of paraffin four parts gomenol, and two parts of eucaliptus oil.

Some times reaction follows the introduction of oil into the pleural cavity, hence about ten to fifteen c.cm. of this should be introduced first and the result watched for twenty-four hours or longer, if nothing serious happens, about 300 to 400 c.cm. of oil put in finally. Skiagram should form a guide as to the degree of collapse and whether more oil is requird or not.

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37. Nissen (1939, June. 21.) Brit. Med. Jour. p-100.
38. Chandler (1937) Brit. Med. Jour. 1, p. 65.

Phrenicotomy[39] *or Phrenic avulsion.*—

The phrenic nerve is paralysed either by cutting or crushing, or by pulling the nerve out. The latter procedure is termed phrenic avulsion. The dome of the diaphragm rises up and the affected portion of the lung, if situated at the base, gets some rest. In those cases where only temporary paralysis is required the nerve should be crushed and recovery may take place in about six months time. The question of avulsion may have to be considered if it is decided to make the unilateral paralysis permanent.

Indications.—(1) In chronic unilateral lower lobe lesions, tuberculous or otherwise.

(2) To relieve cough or hiccough as a palliative when they are protracted and distressing.

(3) To supplement artificial pneumothorax where it acts by relaxing adhesions.

(4) In aid of A.P. to reduce the size of the pneumothorax cavity and thus to lengthen the intervals at which refills are to be given.

(5) To diminish the size of the pleural cavity in certain cases of pyopneumothorax, when re-expansion of the lung is slow.

(6) As a substitute for A.P. when a free pleural space is not available in the case of predominantly unilateral lesions of a sub-acute or chronic variety, preferably confined to the lower lobes.

(7) As a preliminary to thoracoplasty to make the patient a safer operative risk.

Some experienced workers prefer phrenic avulsion to artificial pneumothorax treatment,—because the patient is thus freed from the risk of pleural effusion and the complications inherent to A.P. treatment, and the refills. If required and the disease gets worse even after phrenic avulsion, artificial pneumothorax may be induced at any moment. Against this view may be argued that paralysis of the phrenic nerve though gives temporary good results yet the ultimate late results are rather disappointing, and thus valuable time for A. P. is lost. Though phrenic paralysis is an aid to

*39. Weber, Jacobson and others, (1936). Jour. Thorasic. Surg. June, p. 496.

pneumothorax treatment yet it should not act as a substitute for the collapse therapy.

Pneumoperitoneum—consists of injection of air[A] at intervals into the peritoneal cavity through a pneumothorax-refill needle. The resulting air in the sub-phrenic space may assist by raising the diaphragm further by even 8 to 10 inches after the paralysed side has been already raised. It is usually an adjunct to phrenic paralysis. Certain amount of shoulder pain and abdominal discomfort is usual, but responds to commoner sedatives.

The possibilities of this operation has not yet been fully worked out. The duration of treatment depends on the case.

Thoracoplasty.[40] The object is to give rest to the lung and stop the spread of the disease and cause lymph-stasis. The results are more or less permanent, hence should only be advised when fibrous bands of adhesion make artificial pneumothorax impossible. This rather serious operation should not be undertaken lightly and not until repeated attempts at artificial pneumothorax have failed. Though many cases of fibrotic disease do well without any special form of treatment, but if a collapse therapy is decided to be done on a particular case, thoracoplasty may be the operation of choice.

Indications are,—chronic fibroid tuberculosis of one lung requiring treatment because of (a) activity with local spread of the disease (b) open cavities resisting average treatment (c) attacks of fever (d) recurrent haemoptysis where the cause is in localised lesion and the other lung is healthy. *In cases of fibro-ulcerative tuberculosis of one lung* with limited involvement of the other, and when the latter has been quiescent for more than one year.

In tuberculous empyema,—when there is no tendency for the lung to re-expand following repeated aspirations of pus, phrenicotomy preliminary to thoracoplasty gives good results.

General condition of the patient. The general health of the patient must be such as to stand the operation successfully. His tissue resistance is also an important consideration. Radiograms and other means should always be taken for guidance of the doctors at every step of this rather

A. Mallick, Malhotra et al. (1943) Tubercle. Lond. 24. p. 165.

40. Romanis and Sellors, (1936). Lancet, March 28th p. 714.

serious operation. A weak myocardium, and active tuberculous disease are definite contra-indications to this operation. If these factors operate in a particular case, the patient's condition in relation to the above two should be improved by dieto-hygienic methods, rest, open air life etc., and then the operation undertaken. This operation is done generally in two stages and the choice of anaesthesia in an important point.

Pneumolysis.[41]—This operation consist in the introduction of wax between the parietal pleura and the chest wall, over the diseased portion of the lungs. Apicolysis is the chief operation done on the apices of tuberculous lungs.

Treatment of some of the symptoms of tuberculosis.—

Indigestion and loss of appetite,—are common notably in toxic cases and in those on dietetic treatment. Such patients may be given as alkaline bitter mixture like the following, an hour before the principal meals followed by hydrochloric acid and pepsin after food.

Soda Bicarbonate	gr.	15
Tr. Nux Vomica	m.	5
Infusum Chireta	upto fl. oz.	1

one dose an hour before the principal meals.

Glycerine Acid Pepsin	fl. oz	3
Acid hydrochloric dil etc.	upto fl. oz.	4

one teaspoonful in a feeding cupful of water in sips after the two principal meals.

Small amounts of food, such as meat dishes, preceded by Indian bitter curries, in small portions at frequent intervals is better than big meals at a time. Amongst the indigenous cheap appetisers, decoction of chireta in the morning with a pinch of soda bicarbonate in it may be taken early in the morning. Ginger and germinating gram (Chola) chewed well in the early morning and evening, often improves appetite. Cheerful surroundings, specially pleasant company, good inviting preparations, attractive service, dining in the open air, may improve the appetite. Though somewhat expensive a powder like the following after food may do some good.

Lactopeptin	gr.	5
Pancreatin	gr.	6
Takadiastase	gr.	10
Calcium gluconate	upto gr.	30

one powder after food, specially in dyspepsia and weak digestion.

41. Chandler, (1937). Lancet i, p. 83.

Takadiastase and pepsin tablets (P.D.) after food are also useful.

Proper care of the teeth and instructions to chew food well may also help matters. Small doses say 1/4 to 1/2 gr. of gray powder, twice daily, increases intestinal secretion and appetite, so also appears the action of '*Mokorodhwaj*'.

Diarrhoea. Though the commonest cause of diarrhoea is toxaemia, yet not uncommonly milk diet may exite it, hence it (milk) should be cut down or boiled with some starch powder, or reduced whenever this is suspected to be a probable factor in producing this symptom. In some cases specially if due to the disease, intravenous injection of some suitable calcium salt, twice a week, may be of some help. But rest, fresh air, artificial pneumothorax and other measures to reduce the toxaemia, may help along with concomitant symptomatic treatment. Diarrhoea caused by active ulcerative tuberculosis is a grave condition and very difficult to manage. Dovers powder in three to five grains, morphine atropine in suitable doses, or omnopon in 1/3 to 1/6 gr. may be of some use in very intractable conditions. Amoebiasis if associated should receive proper treatment as it helps cure of lung trouble also.[42, 43] Calcium gluconate given intravenously or intramuscularly twice a week, sometimes does good.

Vomiting. This should be treated according to the cause. Cough is often the direct exciting factor and should by allayed by those means mentioned below. Other causes demand suitable treatment.

Cough. Cough may be useful, causing expectoration. It may be fruitless, irritating and of a hacking type. The useless cough may be checked by the patient easily, if he takes a deep breath and presses the jaws tightly by clinching the teeth. A cough, whatever the underlying factor, is very well combated by hyper-aeration and open air life. *Smoking is as a rule injurious* and should either be given up or restricted materially. Sometimes the patient thinks that the cough is good for him, but he should be made to understand that unnecessary coughing tends to injure the lung and cause emphysema by undue strain on the organs, and even may force or aspirate the disease to other comparatively healthy parts of the lung. A lozenge containing about three

42. Dhar (1945. August) Am. Rev. Tuber. p. 31.
43 Dhar (1944. May) Ind. Med. Record. 69. p. 5.

grains of extract of liquorice and half a minim of oil anisi may be kept in the mouth with advantage. Evans' pastilles or similar other throat lozenges are also at times useful to allay an irritating throat cough. Sedatole (Mulfords) may be useful for fruitless cough.

Due to unchecked irritating cough the patients sleep and rest may be interfered with. Under such circumstances, any one of the following prescriptions specially used at bed time may be of some use.

Spirit chloroform	m.	5
Oxymel	fl. oz.	½
Acid hydrocyanic dil	m.	2
Syrup Codeine Phosph	m.	20
Distil water	upto fl. oz.	1

one dose when required.

Tincture Belladonna	m.	6
Diamorphine (Hydrochloride	gr.	1/6 to1/32
Bromoform	m.	2
Glycerine	m.	10
Syrup pruni serotini	upto fl. oz.	1

one dose when required. But it is better that none of the above mixtures should be repeated before three hours.

Codeine phosphate in 1/4 to 1/2 gr. dose; dionin in 1/4 to 1/2 gr. or dimorphine hydrochloride or heroin in 1/12 to 1/32 of a gr. doses may have to be given, the first thing in the morning and the last thing at night. Tincture belladonna, in three to five minims, tincture hyoscyamus in ten to thirty drop doses with menthol may allay the cough.

To help expectoration, early in the morning the well-known Brompton hospitals' simple mixture is of value. One like the following is of use too.

Sodium Bicarbonate	gr.	15
Sodium Chloride	gr	5
Spt. Chloroform	m.	8
Syrup Tolu	m.	60
Aqua Anisi	upto fl. oz.	1

one dose early in the morning with *half a cup of hot water* in sips. In other cases five to ten grains of ammonium chloride may be added to the above mixture with an increased expectorant effect.

That intractable cough due to *adhesion of the diaphragm* may not be relieved by anything else except by causing paralysis of phrenic nerve on that side.

In chronic inflammation of the lungs, potassium iodide in three to five grains, twice or thrice may have to be tried. Along with potassium iodide, some stimulant expectorant like tincture ipecac or ammonium chloride may do good in these chronic cases.

Pain. The cause of the pain should be determined wherever possible. When due to pleurisy, strapping of the parts, counter-irritants, such as camphorated oil, or liniment A. B. C., may be of use. Application of warmth after and before rub of the counter-irritant liniments may help much. Applications of linseed poultice or cataplasma kaolini, may also be of relief. Artificial pneumothorax and thus separation of the two layers of the pleura may be the last resort. Symptomatically the pain may be relieved by either veganin or saridon or anacin tablets three to five grains each. But wherever possible the cause should be found out and proper treatment adopted for the radical remedy of it.

Dyspnoea. This may be caused by numerous factors causing mediastinal displacement or not, in association such as, *chronic fibroid disease of a big area of the lung* with asthma, or in *myocardial weakness*, or due to *superimposed bronchitis* and so on.

In the average case an open air life is one of the best means of combating this condition. *Inhalation of oxygen* may do good in suitable cases. When required, the patient should be propped up by pillows.

Dyspnoea *of artificial pneumothorax may be* successfully relieved by the injection of small doses of morphine and atropine. That due to myocardial weakness may be relieved by half a grain doses of ephedrine orally, or injections of cycliton, coramine, digitalin etc. and other cardiac stimulants.

Pyrexia.—One of the best agents to lower the intractable pyrexia of tuberculous patients is again open air life. Sometimes cases take months to be apyrexial when kept indoors, and such cases when kept more or less in open air outdoor regime, get apyrexial in comparatively much shorter time.

The patient not only should follow the dieto-hygienic measures, but should avoid any physical or mental fatigue, excitement, and gastro-intestinal irritation, as these may readily affect his temperature. In all febrile cases the oral temperature should be recorded and charted every four

hourly. This helps in ascertaining if there is any uniformity in the recurrence of the pyrexia and if there is any relationship with the time of exercise, meals, treatment and so on.

Fatigue indicates rest. Gastro-intestinal disturbances should be combated by proper treatment and change of diet to a simpler and more easily digestible one. In cases of intestinal irritation an effective dose of castor oil may do unexpected good.

Sometimes *a cool or tepid sponging* with toilet vinegar, in suitable cases may do some good.

Night sweat. This rather late symptoms of pulmonary tuberculosis, with secondary infections usually is again successfully treated by *open air regime.* When the sweating is profuse enough to break the sleep and not uncommonly disquietening to the patient, an open air life improves this depressing symptom sometimes to a great extent. Before the patient retires finally to bed a thorough *sponging* given with a solution containing equal parts of saturated solution of alum in aqua distil and rectified spirit, and subsequent dusting well with talcum powder may be of service. When equal parts of talcum powder and zinc oxide are mixed together probably this purpose of dusting is better served. *Some of the drugs* which might be of some use are, agaricin—in 1/10 to 1/6 gr. atropine in 1/100 to 1/200 gr. or extract belladonna siccum in 1/8 gr. doses at bed time. Tincture belladonna in five to ten drops may also be tried. But all experienced workers agree that a sound *dieto-hygienic and open air regime* are the best to combat this rather uncomfortable symptom. Sulphadrugs and Penicillin may be tried in bad cases for the secondary infection superimposed on pulmonary tuberculosis.

Insomnia.—The cause should, if possible, be found out, any flatulence, constipation, gastraintestinal disturbance, irritating cough, etc. should receive proper treatment. An open air life, specially during sleep, is one of the best preventives and cures for this condition. Any warm drink such as, vitavose, ovaltine, in milk, before retiring, may do some good. Coffee, tea etc., are better avoided due to their caffeine content, which tends to keep the higher psychic centres stimulated and thus promote sleep-lessness. (see also p. 23.)

Anaemia.—It should be treated by iron arsenic, on usual lines. For the details the chapter on anaemia should be consulted.

Cavities. They demand the same line of treatment as the disease itself. Rest, artificial pneumothorax and other means of combating the disease are also effective here.

II. *Tuberculosis of larynx*—is usually a secondary complication of an open advanced case of lung tuberculosis, but there may be early haematogenous or lymphogenous lesion in larynx often curable unless the lung lesion is very far advanced. The larynx should be examined periodically by an expert in all advanced cases of pulmonary tuberculosis.

Treatment—(1) *Reduce the sputum expectorated*—by A.P., gold-therapy, climatic change, injections of streptomycin etc. as infected tubercle-positive sputum is a source of danger to the larynx.

(2) *Rest to avoid play of the larynx*—by complete and absolute silence for months. He writes things down instead of talking even in whispers which also spoils the good derived from complete silence.

(3) *Cauterization*—where possible, should be done by an expert.

(4) *For pain,* five per cent cocaine spray or insufflation of orthoform (Bayer) (5) Injection of streptomycin (see also page 62. chapter. 7.) may be of considerable efficacy. (see also page 68 streptomycin in tuberculosis.)

III. *Glandular tuberculosis.*—The glands affected may be (1) *Cervical* (2) *Bronchial,*[45] (3) *Mesenteric,* some of these may caseate with various results, or gradually get smaller and fibrosed or when the body resistance improves they shrink and become smaller.

Treatment—consists in *improvement of general health* by good diet, vitamins, *cod liver or shark liver* oil, diet should contain, milk, eggs, butter, leafy-vegetables, fruits as in pulmonary lesion. If febrile rest in bed, injection of calcium, or collosal calcium with vitamin D., very minute doses of *ethylester* of *hydnocarpus wightiana,* or hydnocryole may be tried in indolent cases. In afebrile cases injections of minute doses of *tuberculin* may be of use. Where available graduated *exposure to ultravoilet rays* may be useful. A *tonic* containing iron, arsenic, calcium, and syrup ferri iodide, with purgative, when constipated helps much to bulid up resistance. Surgery may be the last resort.

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44. Blegvad (1937) Proc. Roy. Soc. Med. 30 p. 221.
45. Westermark (1940. Aug.) Acta. Radiol. 21. p.p. 399-442.

Streptomycin injection may be useful. IV. Intestinal tuberculosis is usually a very difficult problem in medical practice. When tuberculous enteritis follows, swallowing of sputum from advanced cases of pulmonary lesion the prognosis is usually serious .*Management consists* in improving general healthy, digestive medicines, tonic, square diet. Some cases improve on (1) judicious *exposure to ultraviolet rays*; (2) gradually increasing but *massive doses of codliver or shark-liver*[46] *oil and lemon juice*. (3) *Oxygenation* of the peritonium by surgical measures or by other methods. (4) Injection of calcium etc. Intravenous injection twice a week of a three percent solution of Sodium morrhuate, starting from 1 to 2 c.c. till 5 to 10 c.cs. are given, 20 to 30 such consist of a course and may be of use.

CHAPTER XV
DIPHTHERIA

Diagnosis,—

"There are two examinations too often overlooked or slurred that should be made in every instance of infection in infancy, unless the lesion is more than obvious and even then, in search of complications, namely the ear and the throat. Humiliation comes to almost every man who wilfully or inadvertently overlooks these procedures"[1]. For proper view the posterior part of the tongue should be pressed to get a good view of the fauces.

In children, every inflamed throat should be regarded as[2] suspicious and the clinical diagnosis should be supplemented by bacteriological examination before any antiseptics are applied locally. But cases arousing the least suspicion should be treated by adequate doses of diphtheria antitoxin,[3] and penicillin.

A membrane stuck on the surface of the fauces or on one or both tonsils or on adjacent parts of the throat is generally diagnostic. Tonsillar inflammation if accompained by

46. Mc Conkey (1941. March) Am. Rev. Tuber 43 p.p. 425 to 428.
1. F. S. Meara, (1921). Treatment of acute infectious diseases. p. 442. Macmillan Co—1921, N.Y.
2. Text book of the practice of Medicine. Edited by F. Price.—Diphtheria. p. 47. 1924.
3. Jour. Amer. Med. Assoc. March 7th, (1936). Vol. 106: 10. p. 874.

hoarseness or rhinorrhoea or albuminuria is highly suggestive. "As a rule pallor of the mucous membrane and absence of pronounced fever are striking features of the disease." These remarks are worth remembering for diagnosis of diphtheria. Diphtheria, being by nature, a comparatively fatal disease, young practitioners may have the idea that it gives rise to high temperature and other corresponding groups of associated signs and symptoms.

In laryngeal Diphtheria. Croupy cough, stridor and hoarseness of voice are diagnostic, but they may be lacking too. Dyspnoea of an inspiratory type in young patients should arouse suspicion. Aphonia may replace hoarseness later on.

But bronchial asthma, foreign bodies in the respiratory passages and similar conditions, should have to be differentiated from true diphtheria of the larynx.

The diagnostic importance of early signs and symptoms varys considerably. By analysing a group of cases one found the following early signs and symptoms to be of value. Salivation, inability to suck the breasts, adenitis, slight fever malaise and asthenia generally out of proportion to the fever are all suggestive, specially in children who cannot talk. Children who can talk may complain of sorethroat and a sensation of some thing sticking, may show also the same groups of signs and symptoms as are encountered in cases of diphtheria in the inarticulate infants, enumerated above.

Temperature. Analysis of the temperature charts of about hundred cases of diphtheria, more than half of whom were bad enough to require almost immediate tracheotomy, showed on admission into the hospital, a maximum temperature of about 101°F or slightly more. Hence that diphtheria does not cause very high rise of temperature, is a fact worth remembering.

Nasal. A persistent sero-sanguinous or bloody nasal discharge, if associated with excoriation of the nostrils, should always arouse suspicion of diphtheria infection, and be confirmed by cultural results.

Culture. The throat swab should be taken by a care ful twist of it on the edge of the membrane and not on the clinical cases of diphtheria, showing repeated negative cultural result. This should not deter one from giving prompt surface. But one has seen quite a number of undoubted specific treatment coupled with penicillin.

Cardiac failure and myocarditis may manifest itself during the acute stage of the disease, or as a sequel it has caused many unexpected deaths during convalescence. This complication, specially the sequel, unless carefully remembered and treated by prolonged and absolute rest, the doctor sometime may have to regret.

The suggestive points by which one can point towards the cardiac involvement are in short, systolic murmur at the apex, pallor or restlessness, cold extremeties, rarely cyanosis, unusually quick or irregular pulse, vomiting without any apparent reason, low blood-pressure, air hunger etc. Later on, due to defect in conduction, slowing of the pulse may be noted. The risks of cardiac failure persist as long as there are any signs of paralysis and this may extend up to two months or longer.

Commoner Complications.

Nephritis,—albuminuria is practically always present, at some stage of the disease specially in all severe cases. But actual nephritis has become lesser since the introduction of antitoxin. Casts in the urine, are highly suggestive of renal involvement. It is in *severe cases of diphtheria that acute interstitial nephritis has been met with.*

Haemorrhage in to the adrenal glands. This is not uncommon and may account for the low blood pressure and other signs and symptoms noted in this disease.

Bronchopneumonia,—is commoner in the laryngeal form, by the end of the first week, and caused about forty-six per cent of deaths in days of intubation. It is frequent after tracheotomy and is specially dangerous in infants and young children. The causes of pulmonary involvement are, (1) exhaustion of the muscles of respiration working against obstruction (2) lack of food and fluids due to difficulty in swallowing. (3) Loss of sleep, restlessness; (4) insufficient oxygenation. (5) Downward extension of the infection and secondary invasion by other bacteria.

Suggestive points in diagnosis of bronchopneumonia are,—the temperature ranging higher than usual, altered pulse respiration ratio, and some times the working of the accessory muscles of respiration, and typical physical findings in the lungs and so on.

Paralysis.—Post diphtheritic paralysis is encountered in about twenty to forty percent of all attacks of the disease, though different epidemics may show difference in incidence

of this complication. It is commoner in the younger subjects.

The local paralysis is diagnosed either by nasal voice, inequality of motion of the sott palate and regurgitation of fluids through the nose. There may be loss of sensation in the throat, and also the power of deglutition. Not infrequently diagnosis of diphtheria is first made when the patient is seen for paralysis. There may be paralysis of the intrinsic and extrinsic muscles of the eye, with loss of accommodation and inability to read. Extensive paralysis of the skeletal muscles is not rare. Some patients show severe paralysis with involvement of even the diaphragm. Generally these appear from three to five weeks after the onset. Under competent treatment, it may take several weeks to clear up.

Adenitis.—The cervical glands are frequently involved and the bull-neck may give the only clue to the diagnosis. The glands may suppurate specially in severe cases, where superinfection by strepto or staphylococci of high virulence are common.

Rashes.—Those appearing early in the disease are of serious import, and may be of erythematous or other types. These should be distinguished from serum rash.

Otitis Media.—Diseases of the middle ear through the Eustachian tubes, are frequent[4] in throat affections. In debilitated patients the sequela of otitis media as mastoid abscess may rarely be met with.

Association of other diseases.—There may be associated whooping cough, measles and other infections which also make the out-look correspondingly grave.

Toxic Diphtheria.—Since last few years both in Europe and North America cases of toxic diphtheria are on the increase. "In many cases the initial stages of the disease are atypical and first important hours go by without a diagnosis being established, sero-therapy is then attempted, but it comes too late to be of any benefit."[5] Diphtheria[6] gravis or grave diphtheria, is also increasing; none can as yet difinitely say why it is so. "Finally, let it be pointed out that, according to the modern view, diphtheria may be reckoned

4. Calmanas, (1934). These de Paris. No. 325.
5. Foreign letters, Jour. Amer. Med. Assoc. (1936); April 10th; 106: 16; p. 1404.
6. Parish and wright, (1935). Lancet i. p. 600.

as a state of general illness where in the tonsillar changes are only secondary phenomena conditioned by the elimination of bacilli". Recently De et al have reported very favourably on penicillin therapy.[A]

TREATMENT

Prophylactic. When a case occurs in the school or in the family, all susceptibles should be isolated and kept under supervision, their throat swab regularly cultured and proper methods for immunisation adopted.

For immediate, passive, short lasting immunity, about fifteen hundred units of some dependable diphtheria antitoxin may be injected subcutaneously or intramuscularly. This should always be supplemented by the simultaneous injection of one fourth to half c.cm. or[7] more, according to the age of the subject, of an alum precipitated toxoid.[8] It can be given to persons above or about the age of one year,[9] specially when found susceptible by a proper Schick's test. These toxoid injections may be repeated at 2 to 3 weeks interval, till three are given. Now a days formal toxoid (F.T) and toxoid antitoxin flocules (T.A.F.) are also used, in combination or singly with pertussis vaccine.

The protective immunity of antitoxin, generally lasts for one week or a little more, but this active immunisation by the injection of toxoids, is seldom just protective enough, before three weeks, and as a rule, not until the second month, in some cases may be delayed up to the sixth month. When tested after three months about seventy five percent are protected by one dose of toxoid only, about ninety per cent by two doses and nearly ninety five or more percent, by three doses.

This and similar methods of active[10] immunisation against diphtheria have won a second battle, in the more progressive countries, next to that against smallpox, in the fight for prevention of diseases.

A. De, Chatterjee and Ganguly (1946) Jour. Ind. Med. Ass. Dec. p. 73.
7. Jour. Amer. Med. Assoc. (1936). January 11th: 106: 2: p. 148.
8. Jour. Amer. Med. Assoc. April 18th, (1936). 106: 16. p. 1399.
9. Michie (1936) Jour. Amer. Med. Assoc. 106: p. 1756.
10. Bousfield (1935) Diphtheria immunisation etc. practitioner. 135, Dec. p. 821.

Disinfection and Isolation. The bed linen, the utensils, secretions, excretions and other articles coming in contact with the patient, should be properly disinfected, and the patient isolated.

Personal care and risk of spread of disease. The doctors and nurses should not only be careful of themselves, but they should also take all possible care not to risk other patients lives by carelessness in prophylactic measures. Diphtheria may be transmitted through the negligence of careless doctors and nurses, acting as contact carriers.

Curative Treatment—for General measures, room, etc. see p. 12. chapter, 4, on fevers.

Rest. According to Joe[11] (1936), in general management of a case, the keynote is in the maintenance of the recumbent position and the avoidance of all effort. The patient is initially given no pillow, and in bad cases showing grave cardiac involvement the foot end of the bed should be raised. Sitting up in bed or other strains or efforts may, in severe cases even kill the patient. *This period of rest in bed, should be about four weeks in all average or mild cases and in bad ones for about six to eight weeks or longer.* During the latter part of this period, pillow under the head may gradually be allowed.

After this period of absoute rest the patient may be permitted just to leave his bed and be put on a reclining chair, the effects of this strain on the heart should be very closely watched. Gradually, if things proceed smoothly, he may be allowed to move only a few steps inside the room and then finally by the end of two months he should be taking short walks. In milder cases the above routine may be hastened up cautiously. But grave cases showing cardiac weakness, paralysis, nephritis, naturally require a correspondingly slow and cautious line of management.

Bowels. See page 15 for details under *constipation*.

Urine. The quantity of urine should be always noted. Appearance simply of albumin may be due to fever and toxaemia, but the presence of casts, means nephritis, a serious condition, which deserves due attention and care.

Cover the Abdomen and the Kidneys.—The abdomen and the kidney regions should always be kept covered by either a flannel or some other suitable binder, to prevent local chilling, as it tends to precipitate nephritis.

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11. Treatment in general practice. Vol. 1. Diphtheria, p. 123. Lewis, London.

Diet. There is generally much loss of flesh due to factors discussed already. Destruction of tissues may be due to (1) pyrexia. (2) toxaemia (3) starvation, besides other causes.

Generally, owing to the painful conditions of the throat the patient at the begining has got to be fed on liquids, like milk and its preparations, supplemented by enough glucose, say three to five ounces per day, dissolved in water, flavoured with lemon or orange juice. Spoon feeding is suitable. As soon as the throat condition permits, the diet should be increased to milk puddings, eggs beaten in milk, custards, jellies, mashed potatoes, pounded fish, minced chicken, or any thing within the limits of the digestive capacity of the patient. In Indian homes one can add soft boiled rice, mashed potatoes with pounded fish, boiled fried paddy, or *chipitok*, called "*Khoimondo*" or "*Chiramondo*," the decoction of lentil's etc. Besides these, fruit juice, whey, butter-milk etc. may suitably be given.

But one should remember that in diphtheria, both angina and pharnyngeal paralysis, may make the feeding exceedingly difficult. If due to pain, regurgitation through the nose and disinclination, the diminished food intake threatens the strength of the patient, food should be administered by gavage or by the rectum. The stomach or intranasal Ryles tube, is one of the best for this purpose. But when the patient is more than three years old nasal feeding is one of choice. Stomach tube is easy to be used for children under three years. In *painful throat conditions,* the patient's disinclination for food and drink may render him dehydrated, here Murphy's rectal drip method should be taken resort to. Intravenous or intramuscular glucose is often life saving[12] in these dehydrated toxic cases and see also page 17.

Mouth throat and nose. See fever chapter, page-12.

Ear. As extension of the throat infection by the Eustachian tube to the ear is not uncommonly the cause of otitis media. The ears should always be carefully examined and that daily, specially in cases of pains or aches or in pus formation therein.

Nursing. Nursing should not only be efficient but should also be very cautious; for details see page 20 etc.

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12. Medical Annual. (1936), Diphtheria, Treatment, p. 164.

Specific Treatment.—

Early and adequate. The two main principles in giving specific diphtheria antitoxin are an *adequate dosage* and *as early in the disease as possible combined with three hourly injection of* 10 *to* 20 *thousand units of penicillin till the patient is safe* the antitoxin in sufficient dosage in any suspicious case without wating for the bacteriological confirmation. *Penicillin kills the organism of diphtheria but antitoxin is needed to counteract the effects of toxin.*

Dosage. There are many points modifying the dosage of the antitoxin. But generally the extent and severity of the local lesion, adenitis, faucial and palatal oedema, fetor, amount of toxaemia, severity of the attack, and lastly the day of the disease, supervension of complications or not, pulse rate and so on, will go to determine the dosage of the antitoxin to be administered. As young children are liable to have more severe attacks, and as the toxins liberated from the sites of infection are not in any way lesser, due to tender age or smaller size of the patient, all the English workers do not make the dose smaller and that rightly too, as compared with that given in comparatively older patients with a bigger sized body. In practice, since we find that a single large dose of the antitoxin given early in the disease, affords better results than comparatively smaller doses repeated at short intervals, though the total dosage given by the latter method may be bigger than the initially given large single dose. The ideal would be to give *adequate dosage of serum as early in the disease as possible, combined with penicillin, wherever possible, failing sulphadiazine,* instead of spending valuable time on smaller repeated doses of serum.

The dosage usually employed is about twenty to forty thousand units by a single injection in mild cases with slight patch on one or both the tonsils, having only slight or no adenitis and without any toxaemia. It may have to be repeated if required. This dose is also employed for purely nasal cases. In cases of moderate severity, in which both tonsils are covered with membrane with a tendency to spread to faucial pillars, palate, uvula and in the presence of slight toxaemia with moderately enlarged glands should receive, two successive doses, *of thirty to forty thousand units each and regular* 3 *hourly penicillin therapy for a week or thereabout.* Severe cases, with extensive membrane in the fauces and nasopharynx, pronounced local oedema marked adenitis, quick pulse, intense toxaemia, prostration as shown by drowsiness, albuminuria, should get sixty to

eighty thousand units or more, to be repeated on successive days according to indications, coupled with penicillin for one week or longer.

It may not be out of place to mention here, that the day of the disease, may form a rough guide as to the amount of the antitoxin to be given in a particular case. But here too, one should remember that the extent of the membrane may not form a safe guide as to the dosage of the antitoxin to be given, as some of the grave cases may only show small patches of membranes, whereas, extensive membrane may be encountered in comparatively mild cases. But faucial oedema, toxaemia, adenitis, prostration, pulse rate, the day of disease etc. however will give a clue to the severity of the case and to the dosage of the antitoxin to be given. See page 57 for penicillin therapy.

Laryngeal Diphtheria. In a laryngeal diphtheria as the signs of obstruction of the trachea appear quite early leading to diagnosis and that generally before much of the toxin is absorbed in the system, the patient may not require more than forty to fifty thousand units of the antitoxin. But if severe faucial or nasopharyngeal lesions are present in addition, the maximum dosage as indicated in severe cases, is to be given.

Wounds or Conjunctivae etc. In diphtheria of the wound or conjunctiva, the dosage should be as in moderately severe cases of diphtheria.

Practical Points. In the treatment of diphtheria, the practitioner should not be misled by any mistaken view of anaphylaxis, (see serum therapy) but should always remember that to spare antitoxin is to spoil the patient's chance of recovery. In very severe cases even enormous doses of the serum may not produce any appreciable anaphylaxis. Moreover the introduction recently of concentrated refined antitoxin has made the incidence of all these unpleasant symptoms negligible. As the importance of early administration of antitoxin and penicillin has already been emphasised so also one should bear in mind that it is a mistake to suppose that antitoxin is useless after the fifth day of disease, as is sometimes taught. Though late administration of the antitoxin is not so efficacious, yet there is no doubt that apparently hopeless cases have been cured by massive doses

say two hundred thousand units given late in the disease. Combined with sulphonamides better penicillin the secondary organisms are ably destroyed. Penicillin leaves no carriers as it is bacteriostatic to the causative organism of diphtheria.

Route and Site of injection.

The outer side of the thigh is a suitable place for intramuscular injection of the antitoxin. Thigh is a better place than the buttocks because, not only there is lesser risk of injuring important blood vassels and nerves, but also because the femoral muscles are more compact and thus help rapid absorption of the antiserum by exerting pressure on the injected fluid. For practically all mild and slightly bad cases this is the route on which the medical man can depend. But before all serum injections the doctor should exclude asthma in the patient or in the family or former history of serum administration in the patient and so on. For this the chapter on serum therapy in page 10, is to be consulted.

In all moderately severe cases, the major part of the refined concentrated serum *should be given per vein*. But before giving serum intravenously all remote possibility of sensitiveness should be excluded cautiously, otherwise when serum is given intravenously in a sensitive patient, there may be sudden death due to anaphylaxis. But fortunately this risk has been very much minimised by the introduction of refined concentrated sera, because, from the latter the reaction and allergy producing elements have been practically eliminated. In all severe cases no pains should be spared to give the total quantity of serum intravenously.[12] The veins of children are not apparent for easy intravenous serum administration. In such cases antitoxin can very well be given by the *intraperitoneal*[13] route. This is carried out by the ordinary syringe and needle, the latter being pushed through the anterior abdominal wall in the middle line about two inches below the umbilicus. The bladder of the patient should be empty, but the injection must be carried out by an expert.

The refined and concentrated sera, has made possible the introduction of very large units of antitoxin in a small bulk. A still greater amount can also be administered by detaching the syringe from the needle for refilling, while

13. Meara, (1921). Treatment of acute infectious diseases Diphtheria. p. 455. Macmillan Company, New York.

the latter is still in the vein or in the peritoneum. But care must be taken *to choose a dependable brand of the antitoxin in all cases of diphtheria.*

In treatment the dosage of the antitoxin should always be so chosen that one errs on the side of over than on the side of under dosage.

For secondary organisms.—Sulphadiazine or sulphathiazole in adequate doses according to age and bodyweight, should be combined with antitoxin therapy till the fever is normal for a few days. Better *is penicillin,* where possible, because it not only kills the secondary organisms but also kills the cor. diphtherae the organism of diphtheria.

Glucose and Insulin.—As in all forms of toxaemia, so also here glucose and insulin[14] are useful. The working principles consist in giving double the amount of glucose in grams as the number of units of insulin.

In those cases where veins are not prominent enough, injections of twelve and a half percent solution of glucose[15] into the subcutaneous tissues, preferably in to the muscles, followed in half an hour to an hour's time by suitable units of insulin may *be life saving.*

Rectal Glucose Saline.—
Two to three ounces, according to age, of five percent glucose solution in normal saline, with one drachm of sodii bicarbonate to each pint, should be given rectally by the Murphy's drip method in all bad cases, to supplement the intake of fluid. This is of special use in toxic diphtheria.

Oral Glucose. Glucose, one hundred to two hundred grams or four to eight ounces should be given orally well diluted either with lemon juice or in food and drink

Saline etc. for details see chapter on fever p-16 etc.

Blood Transfusion in Malignant Diphtheria.—Recently Seckel (1935) emphasises, that blood transfusion is an important auxiliary therapeutic measure in malignant dipththeria.[16]

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14. Joe (1936) Treatment in general practice. Diphtheria, p. 126. Lewis; London.
15. Bennand Hughes etc., (1932). Lancet, i, 28 : p. 281. Hoyne and Welford (1934). Jour. of Pediat. Vol. 642.
16. Seckel (1935). Medizin, Klinik, Berlin, Dec. 6th, 1935. p. 1603.

Cardiac Failure.—At the first sign of this, the foot end of the bed should be elevated. Vomiting and cardiac pain may have to be treated by hot fomentations over the precordium. Oral feedings are contraindicated and only rectal, subcutaneous or cautious intravenous methods of giving saline and glucose, should be adopted. All disturbances, efforts and strains should be avoided and spared to the patient at all cost.

Cardiac stimulants,—such as solucamphre, cardiazol, strychnine, camphor group, caffeine, ether, atropine, ephedrine, adrenalin, are of some or little success. Veritol and ephedrine may be of some use.

Recently hot baths at 105 to 110°F have been advocated for vasomotor collapse in diphtheria, the patient being brought to the bath very cautiously, and kept in it for ten to thirty minutes. But often this entails too much strain on the young patient, hence Joe (1936) has advocated hot air bath instead of hot water bath. But we have found electric baths given by electric bulb fitted up in a cradle to be also of some use. Where these mechanical devices are not available, several hot water bottles well protected by towels or other suitable methods, not to cause any burning of the skin, and covering up the patient by blankets, may help to tide him over these critical moments. In all cases of quick pulse in comparatively grownup children, strophanthin and glucose or cortical extract of adrenal gland, per vein may be tried, as in young children digitalis group of drugs are not of much effect. Patients showing any severe degree of cardiac weakness should be warned against taking any strenuous physical exercise for at least six months after convalescence from diphtheria. See also page 13.

Paralysis. In mild cases of paraesis or palsies spontaneous recovery on some suitable tonic like that of Easton's syrup may be quite easy. But in more severe cases the patient should be given strychnine in liberal doses, and according to indication atropine, ephedrine, adrenalin, caffeine etc. In paralysis of the diaphragm, carboxygen inhalation and ironlung where available, and other suitable methods are indicated. In advanced countries oxygen tents and iron-lung are used with great usefulness. In the paralysis of the skeletal muscles, massage, counter-irritants or camphorated oil rub, passive movements and electrical treatment may be necessary. Injections of B vitamin or liver extract both orally, may help in hastening recovery.

As all fluids are regurgitated through the nose, diet should be given in the form of semi-solids. For this purpose mashed potatoes, sago-pudding, custard, jellies, ice-cream, etc. may be used with advantage, other liquid foods may be thickened and made semi-solid or pasty by the addition of Benger's food or some such suitable agents. When the paralysis is more severe, nasal by Ryles tube and rectal feeding should be taken resort to. But in oral feeds with paralysis there is the risk of food passing into the respiratory tract resulting in broncho-pneumonia. Nephritis and broncho-pneumonia should receive their appropriate treatment.

As soon as there is suspicion of laryngeal affection, antitoxin and penicillin, should at once be given, and that according to indication. For this seldom more than thirty to forty thousand units of antitoxin and 3 to 7 days penicillin therapy are required, for the early cases. When signs and symptoms of dyspnoea develop hot fomentation to the neck, inhalation of steam with tincture benzoin compound vapour, or sedatives like potassium bromide and chloral hydrate each in three to ten grain doses, according to the age of the child and *prompt intravenous administration of antitoxin* in fifty thousands units, combined with penicillin injections 10 to 20 thousands units intramuscularly every 3 hourly may even avert a tracheotomy. In America and Europe suction of the membrance through the laryngoscope is practised.[17] This whole operation only takes a few minutes and no general anaesthesia is required and there are quite a number of advantages in its favour.

The details of the processes of intubation and tracheotomy though are beyond the scope of the present work yet a few important points about the latter may not be out of place.

Tracheotomy. If, besides stridor and aphonia, there are cyanosis, spasms of cough, dyspnoea, restlessness, and marked recession of the soft parts, specially the lower intercostal spaces, pit of the stomach, and the root of the neck, an immediate operation is necessary. In the hospital, though under such circumstances, one can afford to give the expectant treatment a trial, yet tracheotomy is the only means of giving relief to the suffering child, notably in private practice.

17. Tolle (1930). Amer. Jour. Dis. Child. 1930. 30: 960.

Generally, in the actual operation, the child is wrapped tightly by a bed-sheet or a blanket to control the arms and legs and placed on the table with a sand bag between the shoulders. The cricoid cartilage is felt and an incision of about an inch is given below that, exactly in the middle line, and always care being taken to go on deeper exactly *in the middle line,* otherwise trouble will crop up. After the incision the rest of the operation is preferably done with the help of the dissecting forceps and retractors etc. till one comes upon the rings of the trachea, the upper two of which, felt and when made sure, are opened up by a knife, and a tracheal dilator used to dilate the opening. Care should be taken to prevent the sudden expulsion of frothy sputum, during fits of cough of the patient, to come in contact with the eyes of the doctor. Once the sputum, and mucous are coughed out, the tubes are properly put in, and the boric lint inserted between the shield and the skin to prevent infection and boring in, of the tubes. For the details of this very important operation, the suitable monograms or text books should be consulted.

Aftercare. Though there is much relief to the patient after tracheotomy, yet the whole success depends upon the early successful removal of the tube. The inner tube should be cleansed up by a sterile swab, whenever it gets blocked by accumulated sputum. Also the inner tube needs proper cleansing, every few hours after removal, by soaking in a strong boric acid solution. The outer tube should on no account be allowed to be removed. After twenty-four to forty-eight hours of antiserum and penicillin treatment, when the passage is likely to be clear, every effort should be made to replace the metal tube by a soft rubber one, which also should be removed subsequently as soon as possible. The sooner they are removed the better. Before finally removing the tube, trial should be given, by closing the opening of the tracheotomy tubes by the finger tip and if then also no dyspnoea occurs, it is safe to remove them finally.

Though the obstruction, in some cases, specially if the tube is left long, mainly is psychological, yet organic obstruction due to granulation above or below the wound may be the cause of the lingering late dyspnoea. *Bronchopneumonia* of varying severity, due to aspiration of the septic material, as well as due to inhalation of infected air directly, may follow within a day or two of the operation and need general lines of management. Stimulants, oxygen, good nourishing diet, glucose and insulin, saline, sedatives and so

on, are all indicated according to circumstances. Penicillin and sulphadiazine are useful here.

Isolation. The patient should be isolated till two or three consecutive weekly cultures of the throat swabs have proved negative.

Convalescence. In all grave cases the recumbent posture should be maintained, as suggested in the preceding pages, for about three months or more. Suitable open air life, tonics, iron, arsenic, nuxvomica and vitaminous diet, specially with adequacy of codliver oil, and fruit juice, eggs, milk and others. Ferradol, and syrup minadex are suitable to improve the general condition of the patient.

Carriers. Systemic injections and local spray of penicillin (see page 42) in the throat clears practically all carriers so far known, a very important and thorny problem has thus been solved.

CHAPTER XVI.
INFLUENZA

Diagnosis.—

Clinically. During epidemics and pandemics the diagnosis presents little difficulty in cases begining with chill, fever of short duration, headache, general pain, loss of appetite, prostration out of proportion and so on. Catarrhal disturbance of the naso-respiratory tract are generally the rule, but they may be transient and overlooked in the predominance of nervous and gastro-intestinal symptoms. But this disease may show protean manifestations and may simulate many other conditions.

Pronounced malaise and prostration of influenza tends to differentiate it from ordinary coryza. Enteric fever is slow in onset and does not usually show initial coryza and other symptoms characteristic of influenza.

Influenzal Pneumonia. It presents very little difficulty during epidemics or pandemics. Insidious onset, without chill or stitch at the side, with thin reddish bloody or purulent sputum, in contrast with the rusty tenacious sputum, with sudden high temperature, leukocytosis, localised signs and symptoms confined to one lobe and terminating by crisis in lobar pneumonia. Influenzal lung complications are usually patchy and bilaterally distributed, that is generally broncho-pneumonia, with wider fluctuation in the temperature and a more prolonged course. There is generally a leukopenia in all these cases of influenza. During the

pandemic of 1918, cases of lung involvement showed remarkably serious symptoms, though at the begining one could hardly foresee the seriousness of such affections. They became, prostrated, deeply cyanosed, and died ultimately in a state of coma, no treatment being of any use. At autopsy they showed dilatation of the capillaries and a great dilatation of the right heart.

In some cases severe symptoms of trachitis and bronchitis pervaded the whole picture.

A *slow pulse* of about hundred per minute when accompained with high fever and a fairly toxic state is a striking feature and often diagnostic of the disease. Even when pneumonia would set in, the pulse rate would not be accelerated materially and this is a point of diagnostic significance. In the pandemic of influenza of 1918-19 the incidence of this disease was higher in young and healthy adults than in children and elderly, persons of robust physique seemed to suffer more than persons of poor health. The causative organism did not attack persons of low general resistance but queerly the robust and healthy persons were chosen out.

Sinusitis. Recently influenzal attacks are associated with sinusitis in a large proportion of cases. Prostration mental and physical are common after-effects.

TREATMENT

Prophylaxis. As the disease, in all probability, is caused by a filter passer,[1] recently Salk and his coworks (1945)[2] using a large quantity of virus as a prophylactic vaccine got encouraging results. It is being given trial in America with promising results.[3] The super-imposed secondary bacterial vaccine is also tried.

Specific therapy. In streptomycin we have a *specific against haemophylus influenza organism.* Even *influenzal meningitis* specially in children, a highly fatal disease, is being fairly treated by systemic injections as well as by one

1. Dochez and others (1936). Studies of virus of Influenza—Jour. of Expt. Med. N. York, 63 : April 1st. p. 681.
2. Am. J. Hyg (1945. Nov.) 42. p. 307.
3. Editorial (1946. Jan. 26.) Jour. Am. Med. Ass. 130. p. 212.

daily intrathecal instillation. For the details see chapter 7 on streptomycin page 62, and for influenzal meningitis page 67.

The secondary invaders mostly cocci causing pneumonia etc. may have to be treated with *sulphadiazine and penicillin.*

General Measures—for Rest, Room, isolation see p-12 etc. fever, chapter 4.

Caution. Cases of influenza not uncommonly begin as trivial cold and after the first febrile state, the patient is tempted to go out to work, whereupon he may promptly come down with a recrudescence of the infection coupled with broncho-pneumonia. Hence the importance of enforcing strict rest in bed even after the patient has become afebrile for two to three days or more.

Room. "The *room* should be as airy as possible and, by preference warmed by a coal fire. A free current of air is probably the most important single point in the whole treatment. If both ventilation and warmth cannot he obtained at the same time, then preference should be given to ventilation."[4]

Isolation. "In[5] the hospitals a cubical system should be adopted. The patients should be separated by efficient screens or sheets. It seems criminal to permit one patient who may be suffering from streptococcal pneumonia to cough in the face of another patient across a short space between the beds."

Dry sweeping of floor is not permissible but only should be scrubbed by water containing sufficient bleaching powder or phenol or cresol in it.

Bed. This should be as in typhoid fever.

Doctor and the nurse should protect themselves from the sources of infection. Though linen masks are not adequate protection yet one should try not to be a contact carrier of the disease to the next patient. This is a very important consideration for the doctor in all these infectious diseases.

As soon as the doctor or the nurse shows any symptoms of cold he should desist from his visits and treat himself

4. Lord Horder, (1936). Influenza. p. 2 Treatment in General Practice; Lewis; London.
5. Meara, (1921). Treatment of acute infectious diseases, p. 240.

and remain isolated preferably in bed, keep himself warm, conserve strength and energy, specially during epidemics.

Nurse. The nurse should also take the above precautions.

For sporadic influenza, which is not so infective, the above measures may not be followed up rigidly, but the principles may generally be adhered to, with advantage.

For care of Eyes, Nose etc. see page-20.

Secretions. The secretions and discharges of the nose and mouth are highly infective and should be caught in linen and burnt down each time. Dishes, utensils, bed linen should also be disinfected properly.

Bowels. The bowels should be opened at the begining as in tonsillitis. For children castor oil in two to four drams may be useful. Later in the disease, enema should be the method of choice for moving the bowels, because purgatives at this stage may exhaust the patient unduly.

Bedpans. Bedpans should always be insisted upon because the conservation of energy from the very begining is of help and is a prudent procedure.

Skin, sponges, etc. See page 20 etc.

High temperature, for details of management see page 22.

Diet. Diet should be restricted to warm liquids, preferably every one and a half to two hourly during the day and every three to four hourly by night, provided the patient is awake. On no account the patient should be roused from sleep either for feeding or for taking the temperature or for medication. "Feeding up" is not to be encouraged and the desire of the patient for food, and his likes, habits should receive due consideration.

Water. Drinking of plenty of plain water should be encouraged. When there is temperature and if to the liking of the patient, it may be given cold. Water, alkaline drinks, fruit juices, barley water, and soups may be freely allowed.

Glucose water with citrates in it, to promote diuresis and to give additional food and nourishment to the heart, is usefully provided if there is not flatulence or diarrhoea.

Aches and pains, are relieved by either Dover's powder, five to ten grains with sodii salicylate in same dose with sodii bicarb in double the amounts.—for the details see page—22 to 24, on fever.

Fruitless Cough, should be prevented by a prescription like the following.

Syrup Codeine Phosph	m.	40
Syrup Pruni serotini	m.	60
Tr. Camphor Co.	m.	15
Syrup Tolu	m.	60
Water	upto fl. oz.	½

One dose, when the cough is very trouble-some. When the cough is intractable and causes loss of sleep, one can prescribe the following.

Ammon bromide	gr.	15
Syrup chloral hydrate	m.	60
Bromoform	m.	10
Water of glycyrrhizae	upto fl. oz.	½

one dose every three hours in insomia.

In very intractable cases of cough, morphine in 1/6 gr. with atropine 1/200 gr. may be given to an adult, subcutaneously, specially at the early sthenic stage.

Insomnia. Loss of sleep is fatiguing and these cases ultimately do badly. For this purpose revision of general measures, such as, proper ventilation of the room, hydrotherapy, suitable diet, and assurance to the patient may be of comfort. Relief of the toxaemia and nervousness may go a great deal to combat the insomnia. Also see page—23.

Gastritis and Vomiting. In some cases, specially in certain epidemics, gastric symptoms are more common than in others. At the first appearance of these, all food should be stopped for the time being atleast, only sips of water being allowed. A carminative mixture like the following one may be found effective :—

Sodii bicarbonate	gr.	10
Sodii sulpho-carbolate	gr.	6
Liq. calcis saccharatus	m.	90
Liq. bismuth	m.	60
Syrup orange	m.	60
Choloroform water	upto fl. oz.	½

one dose every four to six hours.

When the vomiting is troublesome and is not relieved by the ordinary methods, other measures adopted to stop it as indicated in cholera should be taken recourse to.

Schwanke (1936)[6] described four cases in women who complained of bitter taste in the mouth following influenza. It had no relation to the severity of the original attack.

Circulation. In old or debilitated persons, specially when they are used to alcohol, brandy in two dram to half an ounce, every four hourly may be given with advantage, notably with a weak heart and circulation. It is better given alone. For other details see cardiac stimulants under diphtheria.

Strychnine.—In 1/16 to 1/32 gr. doses every eight to twelve hours by subcutaneous injection, or *Coramine*, or cycliton etc. in one to two c.cm. orally or 1.7 c.cm. subcutaneously every eight hours are useful as cardiorespiratory stimulants. Strychnine is one of the best drugs for stimulation of the respiratory centre in cases of respiratory troubles. Adrenalin, ephedrine, adrenal cortex extract, strophanthin glucose intravenously—may be tried for weak circulation.

Complications like pulmonary oedema, cyanosis, dyspnoea, pleurisy and empyema, otitis media, pneumonia etc. should be treated properly. Meningitis,[7] when of influenzal origin, should be treated by repeated lumber punctures, and other measures discussed under that condition. All these complications may now be ably treated by regular systemic injections of penicillin and streptomycin, the latter is a specific. North and his coworkers[8] treated influenzal meningitis with sulphonamides and rabbits serum with encouraging results. But streptomycin is the best.

Convalescence.—

Undue weakness is common following influenza, hence convalescence should be carefully watched. There is often a tendency on the part of the patient to resume work as soon as possible, and also for reasons of economy the doctor's aid is quickly dispensed with. The doctor too often in his hurry, becomes unappreciative of the importance of extra rest during this period.

Even those cases which do not cause much concern during the active stage of the disease, need be watched[9]

6 .Klin. Woch, 1936. 18: 93.
7. Spekter, (1936). Amer. Jour. Jour. Dis. Child. ii, 1936.
8. (1946 Feb. 16) Med. Jour. Australia 1. p. 215.
9. Fletcher, (1933). Lancet, January, 7th.

carefully. According to all experienced workers at least *four days* complete rest should be given after the patient has become completely afebrile. In cases where the duration of illness has been for more than seven days, this period of rest should preferably be spent in the recumbent posture. If the pulse rate gets unduly slow or quick after leaving the bed, question of further rest should be seriously considered.

The function of individual organs of the body namely *the heart, lungs, nervous system, kidneys should be frequently watched and examined, say every fortnightly,* to investigate their integrity, and the needful should be done if any one is found defective.

The diet should receive special attention. Its quality and quantity should be improved according to the taste, liking and digestibility of the patient.

Daily diet should include egg, milk, butter, some fresh fuits, wholemeal bread with meat at night, and others.

Easton's syrup, ferradol, syrup minadex may be used in convalescence with advantage.

Exertion should be done in moderation and over exertion, worry, etc. should be avoided. Lastly if the patient feels unusually weak, not only work should be very much limited, but the question of change to a better climate should be seriously considered and whenever possible given effect to.

CHAPTER XVII

PERTUSSIS

(WHOOPING COUGH)

Age, Sex. "The greatest predisposition is from six months to five years of age, and over one half the cases occur during the first two years of life.[1]" Girls appear to be more susceptible than boys, children rendered weak have got greater susceptibility. The organism haemophilus pertussis spreads by droplet infection as do other infections of the nasorespiratory tract.

Catarrhal Stage. When an infant or a child of any age, develops symptoms of catarrhal infection with headache, pains and aches, cough worse at night, and there is no history of any previous attack but that of an exposure to infection of whooping cough, one may suspect the disease.

1. Osler's Modern Medicine, Vol. I, Ruhrah (1925). p. 625. Lea and Febiger, Philadelphia; N. Y.

But it can be diagnosed at this stage either by the isolation of the organisms through culture of the throat swab, or when the characteristic paroxysmal cough, commonly known as the 'woop,' has developed. This stage may last for a few days to a few weeks.

Paroxysmal Stage. The fever and the catarrhal symptoms disappear, the cough tends to be typically paroxysmal and the characteristic whoop is heard after each bout of cough. Any irritation, cold wind, excitement, anxiety, fear, precipitates these attacks and the child generally feels when it is coming. She runs to the mother or nurse or grasps the nearest object for support, in their absence, tries to grasp her legs near the knees to brace the body for the approaching attack. She becomes red and congested in the face, the veins stand out prominently on the neck, cyanosis appears, the tongue comes out in a spoonshaped manner, all the accessory muscles of respiraion are brought into play, and the severe explosions of barking cough are followed by a long-drawn inspiratory sound known as the "whoop." Generally the patient vomits after each attack. Each paroxysm lasts from a few seconds to a few minutes. Usually twenty to thirty paroxysms occur a day in an average case, though there is record of one hundred and twenty paroxysms in twenty-four hours in a three years' old child. This stage generally lasts for a month to six weeks, to be followed by a decline in the disease.

Complications. During severe paroxysms, not only *subconjunctival* but also *cerebral haemorrhage, involuntary passage of urine and faeces* may take place. *Haemorrhage* may take place from recent scars, or any ulcer or naevus present in patient. At autopsy haemorrhage has been encountered in the cerebrum, kidney, adrenals and other organs.

Respiratory System. It is more or less involved, bronchitis and broncho-pneumonia are common. Subsequent tuberculous infection is not unknown, but not so common as is supposed.[2]

Diarrhoea and catarrhal states of the intestines are frequent.

Nervous system, is variously involved. There may be delirium, hallucination, depression of spirits, convulsive attacks, paralysis of various types and degrees. Deafness and blindness may occur too.

2. Ambler and Rauis, (1936). Monde. Med. 46: p. 20.

Blood. There is almost invariably a leukocytosis[3] varying from fifteen to twenty-five thousand, of which about fifty to seventy per cent may constitute of the lymphocytes, and such a blood picture is highly suggestive, when the clinical picture is significant. But recently[4] Braschi (1935) reports twelve cases inwhich there was very little leukocytosis.

Culture. Suitably prepared Petri's dishes containing special media favourable for the growth of haemophilus pertussis exposed for nearly fifteen—seconds, at a distance of about five inches from the mouth of the patient, during a paroxysm of natural cough, and incubated for seventy-two hours, may show the typical colonies of the organism.

Atypical Cases. There are numerous cases of undoubted whooping cough, in young adults[5] or in the elderly persons, or even in children who may not show the typical whoop. But the characteristic persistent paroxysmal cough, the typical blood picture, and lastly a positive bacteriological cultural finding clinch the diagnosis.

Cough caused by enlarged tracheo-bronchial glands. The cough due to enlarged tracheal or bronchial glands is distinguished from whooping cough by its non-contagious character and is usually afebrile, the typical blood count is lacking. There is not paroxysmal cough of prolonged periods, no whoop, expectoration and vomiting. It is generally chronic and does not tend to disappear; skiagram may show the glands. Asthma like attacks may occur in this enlargement of the glands.

Wooping cough may easily be distinguished from, asthmatic fits, laryngismus stridulus, foreign bodies in the trachea, and so on. Recently Cruickshank[6] pleads for the name "pertussis" instead of whooping-cough, the whoop developing later on thus delaying the diagnosis unnecessarily.

TREATMENT

Prophylaxis. The child should be isolated for six weeks from onset and if any other young person has got to occupy the same room where the patient once lived, it should preferably be disinfected and kept unoccupied,

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3. Pearson and Neuns, (1937). Lancet, July 31st. p. 254.
4. Braschi, (1935). Pediatria, 13 : p. 396.
5. Mannerstedt, (1934). Jour. of Pediat, p. 576.
6. Cruick shank (1943) Brit. Med. Jour. I. p. 159.

having all the doors and windows opened up and sun's rays being allowed to have a full access for a few days. Children with other diseases due to lowered resistance may get easily infected, hence should be carefully protected. The period of infectivity lasts until the spasmodic stage is over, though the most infective is the early catarrhal phase. Most of the deaths in whooping cough are during the first three years of life, hence younger children should always be protected from unnecessary exposure to infection. Skin test is being utilised lately to detect susceptibles and to desensitize them.

Vaccines. Four subcutaneous injections of about four, eight, twelve and sixteen thousand millions of bacilli, haemophilus pertussis at an interval of about four to six days, according to reaction, often protect to the extent of causing a very mild infection. Complete protection[7] is not uncommon, either. The vaccine must be prepared from fresh culture of recently isolated haemolytic strains of bacilli. Detoxicated and toxoid antigens are being used with encourageing results, very lately[8].

Serum. Convalescent blood, about ten to twenty c.cm. intramuscularly or five to seven c.cm. of convalescent serum[9] for a child of three years, is said to be effectively protective for the time being at least. It may have a curative value too.[10]

Specific.—

Streptomycin injection is expected to have a specific effect. See page 68 also.

General Measures.

Ventilation. Much can be done to render the course of the disease less severe. The measures of great importance are, open air, quiet life free from excitement and irritation, also see page 21 for details.

Clothing etc. A suitable clothing, warm in the winter, and properly comfortable during the summer, is essential. Cold winds, blasts, rains should be avoided. Perspiration may soak the under garment which needs frequent changing.

A flannel *binder* supporting the lower abdomen not only keeps the patient comfortable in cooler months but also gives

7. Sauer, (1935). Amer. Jour. Dis. Child. 49 : p. 69.
8. Weichal et al (1942) Jour. Am. Med. Ass. 120. p-369.
9. Bradford, (1935). Amer. Jour. Dis. Child, 1. p. 919.
10. Beaudet (1944) Union. Med. Can. 73 p. 137.

good support during the paroxysmal cough. For the hotter months ordinary linen may be utilised for this purpose.

Diet. The question of feeding these children assumes a greater importance, in view of the fact that vomiting follows almost every severe paroxysmal cough, leading to malnutrition. Small meals given after the paroxysms may be retained. In the acute stages it should preferably be confined to liquids such as milk and barley-water, milk and soda-water, citrated or peptonised milk, when the digestion is impaired, milk treated with lactic acid bacilli etc. For the younger children the above dietary is suitable.

For the comparatively grown up children, small meals of milk and eggs, fish, chicken, custard, potatoes, boiled rice, pish-pash etc. may be given in the later stages according to taste, digestive power and suitability. Exclusively starchy foods often produce indigestion.

In cases of repeated vomiting, the stomach of the patient may advantageously be washed by asking her to drink a cupful of warm water with a pinch of sodii bicarbonate in it. In a few minutes the patient will vomit it out and thus the stomach gets automatically washed. In bigger children one glassful of warm alkaline water may be given to be drunk for this purpose. This lavage of the stomach may have to be done twice a day in bad cases of repeated and persistent vomiting. The alkaline stomach wash is likely to excite subsequent increased flow of the gastric juice.

Rectal saline. As in page 82.

Drugs. There have been so many drugs advocated that one seriously doubts, if any one of them is of real service.

Some of the drugs in vogue are :—

Belladonna, due to antispasmodic action, does some good and has got to be pushed till symptoms of mild poisoning, such as dilatation of the pupils, dryness of mouth, flushing etc., appear. For children two minims of the tincture with one grain of sodium bromide every three hourly may do some good. But in most cases bigger doses of the tincture are required.

Phenazone, in half to one grain, tincture opii camphorata in two to ten minims, according to age, every four hourly are old, but tried remedies.

A prescription like the following may be useful for a child of two to three years, one dose to be taken four times a day as directed.

Tincture opi camphorata	m.	4
Tincture ephedra vulgaris	m.	5
Tincture belladonna	m.	2
Bromoform	m.	4
Benzyl benzoite (25% alcoholic)	m.	10
Potassium bromide	gr.	2
Syrup tolu	upto. fl. oz.	½

two teaspoonfuls four times a day.

Antipyrin	gr.	½
Phenazone	gr.	½
Ephedrine hydrochloride	gr.	⅛
Luminal	gr.	⅛
Ext. belladonna siccum	gr.	1/16
Sugar of milk	upto. gr.	4

one powder every six hourly for rest and to promote sleep.

Gold Tribromide,[11] in 1/20 to 1/10 gr. thrice daily after meals and once at night. In three to four days cough becomes less frequent, shorter and milder, and it subsides in three weeks in two-third of the cases. Recently Epstein[12] (1936) has recorded his observations of three hundred cases treated with gold tribromide in the form of an elixir known as elixir bromaurate. The results are definitely in favour of this treatment.

Ephedrine Hydrochloride.—In children above one year of age ¼ gr. twice a day, morning and evening, or 1/6 gr. for younger children is being advocated recently. But some children show restlessness, abdominal distension and sweating when treated by this medicine. Under these circumstances treatment by it is contraindicated.

Sedatives. One or several of the following sedatives, given four hourly, may be of use. The common doses of these remedies when given singly are, syrup codeine phosphate, five to ten drops, Dover's powder half a gr., two grains each of chloral hydrate and potassium bromide. In younger children preparations containing opium should always be given with caution.

Ether and Olive oil.

Equal parts of olive oil and ether mixed very intimately may be given slowly, high up rectally through a catheter of

11. Medical Annual. (1936). p. 484.
12. Arch, of Pediat. (1936). 53. p. 52.

number eighteen or twenty, by gravity action. Dose is, one dram per year of age of the patient. If the subject is under one year, a mixture of twenty five per cent ether and seventy five percent olive oil, in the above doses, has got to be substituted for half and half mixture advocated for children above one year of age. If defaecation takes place in half an hour's time, one may have to repeat the rectal medication. In all bad cases this is worth trying.

Thyroid and Suprarenal.—Small doses of dried extract of thyroid and suprarenal glands, say one eighth gr. of the former and one fourth gr. of the latter, every six hourly may be of use.

Vaccination.—If the patient is not already vaccinated against small pox, she should be submitted to it as soon as possible. Not uncommonly this cuts short or ameliorates the symptoms of whooping cough.

Vaccines. There has been very conflicting results published by various workers, on the efficacy of curative vaccine therapy. Begg and Coveney[13](1936) report no demonstrable efficacy from vaccine therapy. Whereas Stallings and Nichollas[14] (1934) treated two hundred and thirty one cases in the catarrhal and paroxysmal stage of whooping cough with an undenatured pertussis antigen in doses ranging from 0.1 to half c.cm. daily until the symptoms got better.

But in practice we find the vaccine to be of some use in majority of the cases, specially when given early. But the *average vaccine is absolutely useless.* In order to be effective the vaccine has got to be made from recently cultured, freshly isolated strains grown in suitable blood media. For this purpose the whooping cough or Pertussis vaccine (P&D) is of good use. The Glaxo's soluble vaccines are worth a trial too.

Serum. Convalescent whooping cough serum in five to ten c.cm. intramuscularly on two successive days, or about twenty c.cm. of convalescent whole blood, given as above, in two daily intramuscular injections in the gluteus, appears to be of benefit.

One has injected young mother's blood ten to twenty c.cm. daily till two to four injections were given with favourable results. *It is worth while trying.* This treatment may be given at any stage of the disease.

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13. Lancet, (1936) i, p. 82.
14. Amer, Jour, Dis, Child, (1934), 48: p. 1183.

Ultra-violet light. About a minutes exposure each, of the front and back of the patients body may reduce the paroxysms by diminishing reflex excitability. How far its general use will be effective in sunny India, one cannot say, though in a few cases this procedure has done apprently some good.

Xray Exposure. According to American workers this therapy is very effective. It appears to act by reducing the size of the mediastinal lymph glands, in those cases where these enlarge and are contributory to the perpetuation of cough.

Water vaporization etc. During the dry winter months, the patients' cough may be very trouble-some. In such cases water vaporised in the room may help in easy expulsion of the phlegm. Inhalation of tr. benzion co. is also of use.

Rub of the Chest. Rubbing of the chest twice a day with a counter-irriant like camphorated oil, or Vicks' vaporub or ozodine with methyl salicylate (I.D.H.) may do some good. In children counter-irritants rubbed on the chest act very effectively in the amelioration of this troublesome cough. The liniment mentioned on page 142 for pain in pneumonia is rather strong but useful.

Treatment of Complications. Bronchopneumonia, convulsion, diarrhoea etc. require their usual line of treatment. Here sulphonamides and penicillin judiciously used may be useful.

CHAPTER XVIII
MEASLES
(Morbilli)

Diagnosis. Commonly met with in children under five years of age, mainly in the winter months, symptoms appearing from nine to eleven days and rash on the fourteenth day of infection. Prodromal rashes, history of exposure, loss of weight, leukocytosis, and Koplik's spots may help in the diagnosis before the rash appears. The cultural results of the virus are promising specially from protective point of view.[1]

About the ninth and tenth day after infection, the child becomes listless and drowsy. "This drowsiness is such a constant feature as to be regarded by some as

1 Geaffery and Rake (1943) J. Pediat. 23. p. 376.

almost "pathognomonic".[2] The appetite is poor or lost. The child may complain of headache, chilly sensation, and a feeling of tiredness. Adenitis may be generalised. During the invasive state sneezing, a dry irritating cough, watery eyes and diarrhoea are not uncommon. Sore throat, vomiting etc., are common too.

Rash. The rash generally appears on the fourth to sixth day of fever and the symptoms become aggravated along with it. The temperature rises upto 104° or 105°F. The eruption first appears about the eyebrow, behind and below the ears and round the mouth. It rarely appears first on other parts such as buttocks, thighs and wrists.

It then spreads over the face, neck, trunk and extremeties and is fully out usually in twenty-four to forty-eight hours' time. Small brownish macules first appear, to become papules the next day, with a tendency to fuse into small groups with irregular sinuous or crescentic outlines. Gradually they become confluent on the face, neck, back and extensor aspects of the limbs. The skin is moist and exhales a peculiar musty odour. The rash fades in order of its apperance and disappears in the course of three to four days. The brownish stain may persist for some time particularly in the back. The tongue is at first heavily coated then red papillae appear on it. *A badly erupted rash,* may mean weakness of the heart specially when accompanied by cyanosis.

The clinical types. Toxic type, pulmonary type, haemorrhagic type etc. are classified according to the predominance of one or other groups of symptoms.

Koplik's Spots. Koplik in 1896, pointed out certain spots which now bear his name and are pathognomonic and consist of small irregular areas of a bright red colour and in measles precede the actual rash by 2-3 days. Their centre is noted in strong day light as minute bluish white specks. They though appear most commonly inside the cheeks opposite the second molar tooth, yet may be noted in other places too in the buccal mucosa.

Anomalous Cases. There may be anomalous cases with bronchitis, cough, etc. suggesting other diseases. The patient may complain of extreme headache with photophobia simulating meningitis.

2. Osler's Modern Medicine, (1925). Vol. II. Measles. p. 103. Lea Febigers, publication.

Respiratory. Coryza is common and may be even purulent, hoarseness of voice, croupy cough, sometimes loss of voice simulate laryngeal diphtheria. Trachitis, bronchitis or more serious broncho-pneumonia with all its associated troubles, may appear. The course of this complication may extend even upto six weeks. It is more common in the weak, and debilitated than in the strong. Over-crowding, bad management of the case, unsuitable diet, bad health, etc., all predispose to broncho-pneumonia. *Eye*. Photophobia, conjunctivitis, corneal inflammation etc., are common. I have seen punctiform opacity of cornea developing after an attack of measles. *Ear*. Otitis media, is not infrequent. *Gastro-intestinal*. Stomatitis of some degree is almost always present, usually catarrhal, but may be ulcerative and even of gangrenous form. Colitis, diarrhoea etc., are also common. *Circulation*. Endocarditis and myocarditis may cause death. *Skin* & *Nervous system* are affected in various ways due to complications. [3,4] *Resistance* to tuberculosis is much lowered by an attack of measles.

Differentiation has got to be made from other eruptive fevers.

Mortality, is very high in the infants upto six months, though fortunately they are not frequently attacked. Deaths are higher in the winter than in the summer. Most of the deaths are caused through complications. It is higher in the debilitated, under-nourished, rickety children.

TREATMENT

Prophylaxis etc. A case of measles is very infective from the onset of fever to the eruptive stage. With the fading of the rash the infectivity diminishes. All susceptibles need strict isolaton from the segregated patient.

Protection by Convalescent Serum.[5] Gun (1932)[6] gave from five to twelve c.cm. of convalescent serum with good results. This dosage depends upon the age, state of health and interval after exposure and other factors. To be effective, the serum should be given within five days of

3. Block, (1935). These de Paris. No. 809.
4. Norman, (1936). Lancet, ii, 684.
5. Gun (1942) Control of common fevers (Lancet publication) p. 162.
6. Gun, (1932). Brit. Med. Jour. 1, 183.

the exposure to infection. If convalescent serum is not available, whole blood of young persons who had measles once may be given intramuscularly into the buttocks in twenty-five c.cm. Gun[7] (1932) has found this almost as useful as convalescent serum. Placental extract in ten to twenty c.cm. doses has both definite curative and prophylactic value.[8,9] The Americans advocate bigger doses.[10] Gumma globulin injections have a preventive value. For room, bed, clothing and general measures on nursing, mouth etc. see chapter on fever p. 12 onwards.

General Measures.

The nurse or the attendant or *the mother* should also keep aloof from other susceptibles. It is better that they should be healthy and free from streptococci of the haemolytic type, which some people harbour in the upper respiratory passages. Any person with catarrah is dangerous to these ill children hence the best plan for the attendant is to wear a mask while looking after them. Visitors with cold or catarrh may transmit this apparently trivial infection to patient of measles with lowered resistance, not uncommonly with disastrous results.

Sponging etc. The daily warm routine sponging should always be insisted on. If there is insomnia, restlessness or cardio-circulatory weakness, every four to six or eight hourly sponging with tepid water and the washing of the head with cold water, specially when the temperature of the patient is above 102°F, is of use, notably in most highly pyrexial cases.

Mouth, ear etc. The mouth should be cleansed after each feed, by either boro-glycerine or any other suitable mouth wash. See also page 20 etc.

Stomatitis. It may prove very serious in these not uncommonly debilitated children, hence it is better prevented. A mixture containing the following, may do some good by preventing or curing it.

Pot Chlorate	gr.	1
Acid Hydrochlor dil	m.	2
Syrup orange	upto. m.	60

7. Gun, (1932). Lancet, 1 : p. 675.
8. Karelitz, Greenwald and Klien. (1937). Jour. of Pediat 10 : p. 170.
9. Levitus, (1935). Jour. Amer. Med. Assoc. 105 : p. 493.
10. Stillerman et al (1944) Amer. J. Dis. child. 67 : p. 15.

one teaspoonful every four hourly as directed.

Fissures round or at the angle of the mouth are best treated by covering it by borovaseline or by equal amounts of unguentum hydrarg ammoniata and vaseline. See also chapter on stomatitis. B vitamin complex injection is useful.

Nose. Cleaning and keeping up of the local resistance of the upper respiratory passages in good order are of prime importance to prevent not only septic complications but also broncho-pneumonia.

Eyes. Some degree of conjunctivitis is almost invariable. Milder cases only require the application of borovaseline to the eyelids at night or the dropping into the eyes of one or two minims of liquid paraffin. If moderate inflammation starts, an one per cent boric acid solution should be used to irrigate the eyes, as frequently as the severity of the symptoms suggest. In bad cases a four to eight per cent solution of protargol or argyrol may have to be dropped into the eyes every two to six hourly. Local drop of penicillin may be required. Corneal ulcer etc. are complications requiring care of an eye specialist; see also small pox for care of the eyes.

Bowels. If seen early and the patient is in the sthenic condition free evacuation should be ensured either by castor oil one to two drachms for younger children and infants. Whereas hydrarg subchloride in one eighth to one fourth grain doses every fifteen minutes to half an hour in the evening, till one grain is taken by bigger children, followed in the morning either by Seidlitz powder or Epsom salt or sodium phosphate in two to four drachms and may be of use. In the later, asthenic stages enema, suppositories are advisable. Pulv glycyrrhizae co. half a drachm, in warm milk may ensure mild action of the bowels. Clinically there appears better result in treatment, if the patient's bowels move at least once on alternate days.

Diet. As, some degree of gastro-intestinal catarrh is very common the diet should be regulated accordingly. Anything which tends to upset the digestive tract, may help to flare up a mild or trivial infection, into a severe type of entero-colitis. In the absence of any complications of the gastro-intestinal system, thrée to four hourly feed of suitable quantity and quality of milk, depending upon the weight, tolerance, habit and nature of appetite and digestion may be given. In between these feeds plenty of cool or tepid water according to liking, may be given. Demand for water

may conveniently be met by alternate drinks of plain water and four to five per cent glucose drink in normal sàline, made slightly acid by lemon juice. Children often acquire a distaste for plain or skimmed milk or its modifications during illness, but if flavoured with small quantities of tea or cocoa, they often like to take them. But where possible, Horlick's malted milk, or milk flavoured with ovaltine or vitavose or one of the numerous agents used for flavouring, may be given in very small amounts just to cover-up the smell of milk. As soups, meat extracts, may evoke diarrhoea, they are better avoided specially during the first week. If pure or diluted milk is not properly tolerated as shown by diarrhoea or appearance of curds, the milk may have to be peptonised or citrated. In bad cases whey or albumen water may have to be given for twenty-four to forty-eight hours to stop the diarrhoea or flatulence, caused either by too much of sugar or fat in the diet. Fruit juice, barley water, green cocoanut water, are also suitable when judiciously given. With suitable additions, alterations and modifications the diet may be so regulated that the patient does not give any trouble over the feeds. During *convalescence a* vitaminous tonic like, ferradol or syrup minadex, specially rich in vitamin, A and D may have to be continued in order to keep up the resistance of the patient, and thus prevent supervension of other infections on a system rendered weak through an attack of measles.

Sera. If the patient is seen early within the first two three days and the diagnosis is made, either convalescent or healthy serum or whole blood[11] may be tried in twenty to fifty c.cm. doses, in two to three successive days intramuscularly, into the buttocks. One injection of twenty to forty c.cm. of convalescent serum, given early not only modifies[12] the course of the disease, but definitely prevents complications from developing. In one of our cases convalescent serum saved a young child from severe bronchopneumonia complicating measles, in presulphonamide and prepenicillin days.

Recently injections of two c.cm. of extract of placenta were used with success, as preventive, and five c.cm. as curative of measles. Whatever the theoretical considerations may be, in actual practice convalescent whole blood

11. Knauer, (1929). Jahr b. f. Kinderheilk. 123 : p. 296.
12. Debre and Ravina, (1923). Bull. Soc. Med. Hop. 47 : p. 226.

in fifteen to twenty c.cm., or convalescent serum in ten c.cm. doses intramuscularly and particularly when repeated daily for two to three days is of distinct use therapeutically, as well as prophylactically and is always worth the trial.

Antistreptococcus Serum. For these late cases potent antistreptococcus serum, preferably polyvalent scarlatinal anti-toxin[13] in twenty to forty c.cm. doses may help by preventing the development of such complications, as faucial angina, stomatitis, laryngitis and even a broncho-pneumonia. Penicillin and sulphonamides may do much good here.

Vitamins. The custom of giving vitamins A, B, C and D from the very beginning of the infection, though may not show any marked beneficial results for cases whose diet is not lacking in them, but they certainly are additional forces for an adequate defensive fight in the later stages of the disease. On the few cases that one has tried this method of vitaminous diet from the beginning of infection there seems to be lesser of the complications.

Complications and their prevention and management in short.

Respiratory. The commonest is broncho-pneumonia needs penicillin or sulphadiazine treatment.

When *diphtheria* complicates this disease proper measures as indicated under the chapter on diphtheria are to be adopted. *Otitis Media.* Nearly ten per cent of the sufferers from measles are affected by this complication. The ears should be pulgged by cotton wool while the child is sponged. They should be kept clean and inspected daily without fail, during each visit. With the first appearance of slightest pain sulphadrugs and penicillin administered and hot fomentation applied. A five per cent carbolic acid solution of boroglycerine, with equal parts of rectified spirit, when dropped into the ears every four to eight hours, may prevent its development. It may also act as a curative eardrop. *Adenitis.* This should be treated on general lines and sulphonamides and penicillin tried. *Gastrointestinal.* With the fading of the rash or in convalescence an entero-colitis may occur and is often of serious import. It should be treated as is done under other circumstances. The choice of a judicious diet is of value in preventing this trouble. With the first appearance of symptoms no food should be allowed for twenty-four hours

13. Talyor, (1934). Brit. Jour. Child. Dis. 31 : p. 290.

or longer, except water, in small quantities and frequently. The diet should consist of barley water, arrowroot water or rice water. Milk diluted with lime water or peptonised may be of use in mild cases. During the beginning of the infection, emulsion of castor oil in half to one dram doses, only once early in the morning to remove the irritating contents of the bowels and sulphaguanidine or sulphaphthalidine is of service. Bowel wash with normal saline at 100°F of one to two pints may be helpful. For *pains and colic* hot fomentation may prove effective. But in refactory cases morphine in one fifteenth to one twenty-fifth of a grain with 1/400 gr. of atropine may be the only remedy left to fall back upon.

Collapse. Stimulants are to be used according to indication. Mustard bath made up of one table-spoonful of mustard to the gallon of water at about 100°F or warmer, may be helpful in combating the milder forms of collapse. The whole quantity of mustard is made into a thin paste in a small quantity of tepid water, and mixed with the bath water. The child is immersed into the bath upto the neck and warmer water added to raise its temperature upto 105°F. The child is left from five to ten minutes, then quickly dabbed dry and wrapped in a big turkish towel or blanket. Hot water bag at the feet and ice cap on the head, may have to be given during and after if there is hyperpyrexia or continued high temperature.

In cases of collapse specially due to entero-colitis good brandy, in twenty to thirty drops, per year of age, given few hours may be of help. If there is much dehydration due either to bronch-pneumonia or enterocolitis, orally one per cent to two per cent saline, with five per cent glucose in it, may be given in sips at frequent intervals. Saline in half to one pint, with twelve and a half per cent glucose solution, may have to be given under the skin on the thighs, in bad cases. Rectal saline, of five per cent glucose in normal saline, in two to three ounces, high up rectally by the Murphy's drip method may be of real service and even may be life saving by combating the dangerous dehydration. Sulphonamides and penicillin should be given according to indication.

Convalescence. Watchful care, good vitaminous iron rich tonic like ferradol or syrup minadex, ultra-violet rays, sunny outdoor life in a suitable railing bed placed outside in the open air or verandah may help not only by preventing respiratory complications, but also are of service in

hastening up convalescence. Plenty of fruits, milk, butter, eggs, soups may be of use to build up the health of the patient. Change to a more bracing climate, may do good.

CHAPTER XIX
SMALL POX
(Variola)

General. It is a highly communicable infectious disease, the exact causative agent being unknown. Incubation period is about twelve, but varies from five to fourteen days. It comes with high fever, severe headache and back-ache, suffused conjunctivae etc. The temperature comes down usually from the third to the fifth day, when eruptions appear, first on the forehead and on the palmer aspect of the wrist. The distribution is away from the trunk, the peripheral parts of the body being mostly affected. The eruptions at first are macular then become papular, vesicular, pustular and pass on to the stage of crust formation. By about the end of the first or middle of the second week, the fever of suppuration starts, lasting for about another fortnight or so.

Spread. Aerial convection, droplets, crusts are some of the known means of spread of this disease, but there may be other unknown methods of spread. The incidence of this disease is said to be greater around the small-pox hospitals, than in other part of the city, with general population. It is more prevalent in late winter, spring and early summer months, and the severity of the epidemics varies considerably. Variola Minor[1] is not always a mild disease.

Clinically. The appearance of the patient at onset is one of extreme exhaustion and overwhelming toxaemia. Convulsion in children, in adults delirium, bad dreams, splitting headache, usually more marked near the forehead and the temples, sometimes extending to the whole head are common. Backache of a traditionally severe type was compared to renal colic, by Sydenham, due to its extra-ordinary severity. But all these tend to disappear with the coming out of the rash. There may be gastro-intestinal symptoms of severe type, the tongue as a rule is foul, vomiting is almost invariable. In women menstruation may be earlier than usual, and miscarriage is also

1. Barsden, (1936). Critical Review of the Clinical Features or 13,686 cases of small-pox (Variola-Minor) L.C.C. 1936.

common in pregnant patients. Before the actual eruption appears there may be several types of prodromal rashes.

The commoner types of the disease are :—(1) Small-pox without eruption, but it confers protection. (2) Abortive type, suddenly gets checked by the first week. (3) Discrete type is the usual form of the disease and occurs in those who are partly protected by primary vaccination. (4) Confluent type is not very common. Here the eruptions get matted together, this is a serious form of the disease. (5) Haemorrhagic type, a very serious form of disease and is almost invariably fatal. (6) Purpuric type has a stormy onset, causing sure death.

Diagnosis. This depends on the history of exposure, the vaccinal history of the individual; the protection adequate or not through the vaccination; cases occuring in the town or locality; the typical onset, and so on. With the out coming of the rash, the peculiar distribution helps in the diagnosis. Chicken pox has got to be carefully distinguished from small-pox.

Treatment of Chicken pox requires management and prevention, in the lines of small pox. Vaccination does not protect against this disease.

TREATMENT

Prophylaxis. The best and the only sure method of prevention is by repeated vaccination. Children from the third to the sixth month should be vaccinated by one point linear mark, not longer than one centimeter. This vaccination, provided the technic is faultless and the lymph fresh, will almost invariably take. The child should be revaccinated at the second, fifth, eleventh, sixteenth year, then every two years or so. Girls should be revaccinated at sixteenth and twenty-first year, and subsequently at regular intervals of a few years for the rest of their lives. Compulsory vaccination in Germany has helped in banishing this disease from that country. Vaccination by one point in the early months of infancy tends to make post-vaccinal encephalitis a rarity. The older the age at primary vaccination the greater is the risk of post-vaccinal encephalitis.[2,3,4,5] The attendants, nurses and every one coming

2. Taccone, (1936). Athena, 5 : p. 67.
3. Banarjea, (1937). Ind. Jour. Pedit, 4 : p. 91.
4. Bull off. internat. d'Hyg. publ. (1935). 27 : p. 287 and p. 513.
5. Ibid, (1936). 28 : p. 472.

in contact with the patient should be protected by vaccination and re-vaccination. As the incubation period of small pox is generally twelve days, and the protection conferred by vaccination usually is complete by the ninth day, so if one gets vaccinated within the first day or even second day of exposure, he is as a rule protected without any infection. This is not likely to be the case if vaccinated later than the second day. The fomites, clothes etc., require proper disposal and disinfection.

Treatment of Post vaccinal Encephalitis.

Besides other methods, one of the best treatment is to give intramuscular injection of 10 to 20 cc. of serum from children who have been successfully vaccinated from the same strain of lymph causing the encephalitis. This should be repeated on alternate days thrice; the earlier it is given the better is likely to be the result in encephalitis.

Curative Treatment. One wonders why the public cherish an idea that our modern scientific methods of treatment are not satisfactory for the treatment of this disease. Our method of treatment, is as good, if not better than the much favoured indigenous system.

Hospitalisation is better. Owing to the difficulty in obtaining proper isolation and nursing facilities in an average private house it becomes incumbent to remove the patient to a special hospital which should better be situated at the out-skrits of the city or away from human habitation.

Specific like action—of sulphathiazole and penicillin during the stage of suppuration is very convincing, even cases of confluent small-pox are being successfully treated by proper penicillin therapy. See pages 32 and 61 for details.

Selection of the room etc. See chapter on fever page 12 onwards.

General Measure. In the treatment of other diseases the nurse may be a luxury, but in this infection the nurse is indispensable if the patient has got to be made at all comfortable at the earlier period, later for safeguarding the eyes, and preventing complications from developing. Open air, plenty of water, good care of the skin affected by thousands of painful eruptions, should be ensured at all costs.

Injection of Liver Extract. Intragluteal injections of some good brand of liver extract in five c.cm. for four to five days, followed by two c.cm. daily for another two to three days, often modify the disease, if given sufficiently

early, shorten its duration, abort the eruptions and prevent subsequent hideous scars and pits.[5] Convalescent or immune animal sera, are of doubtful efficacy.[6]

Pains and aches. For the initial headache and pain all over the body, a warm tub-bath is probably most soothing. Cool or tepid sponging followed by an ice-cap on the head may be of relief. The pain and soreness of the stage of suppuration are also very well relieved by warm alkaline tub-bath. As regards medicines, phenacetin in two grains, or the saridon group in five to seven grains, in bad and unbearable cases morphine and atropine may have to be injected according to indication. Chloral hydrate and bromide in fifteen grains each, may be soothing to the irritable nervous system.

Head. It is preferable that the head of the patient should be shaved off, specially in women with long hair. This not only saves a lot of subsequent troubles but probably also gives better growth of hair later on.

Skin Mouth etc. See page 20, and chapter on fever. The teeth, mouth, ear, nose, throat require the same scrupulous care and cleanliness, as in cases of typhoid fever. For cervical adenitis local application either of ice or warmth may be of relief. Ice may be given in small bits to suck, and the febrile patient enjoys it much.

Skin. In children and unconscious patients the fingers and the palm should be guarded by covering them up in a sterile lint tied at the wrist, so that scratching, causing secondary sepsis is prevented. The nails should always be kept short and clean. For the itching of the skin alkaline warm bath or touching the parts with one in fifty carbolic in oil may be soothing. During the later stages of the disease there is a foul emanation from the skin, for this and also to prevent itching and other troubles an oil of the following composition applied liberally all over the skin may be of considerable relief.

Menthol, Thymol, Acid boric, Acid salicylic, Oil eucaliptus, Liquor calsis.—One dram each. Olive oil,—upto oz. 16.

This oil may be used with advantage from the stage of suppuration and subsequently. It not only prevents subsequent scar and pits but also relieves itching and reduces the

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5. Nair, (1935). Jour. Ind. Med. Assoc. 4 : p. 488.
6. Patel, (1938). Jour. Ind. Med. Assoc. March, p. 347.

stink. The crusts when kept soaked with this oil, can not fly about and be sources of danger to others. As a matter of fact, it is by using an oil of the above type, that the indigenous specialists in the treatment of small pox, have acquired their great reputation. On an experience of nearly one thousand cases treated in the special small-pox hospital in the Campbell Medical school, Calcutta, one has been much impressed with the efficacy of liberal use of such an oily application. *Injection of penicillin and sulphathiazole orally or by injection at the stage of early suppuration is of much use.*

For the face. Numerous remedies for local application on the face have been advocated, and a two per cent carbolic acid solution in glycerine, may be used with advantage for the face. If the face is kept liberally moistened with some oily dressing, scars are neither so disfiguring nor so deep.

Dusting Powder, of equal parts of boric acid and zinc oxide with about one eighth its quantity of iodoform, has been advocated by some, but this appears inferior to the oily dressing suggested already.

Snipping off. When the pocks have reached the pustular stage, they may be snipped off with a pair of curved scissors, all aseptic precautions being taken, followed by warm boric or saturated magnesium sulphate compress, with gratifying results. But this is only possible for private cases. In the big hospital wards this is not practicable.

Touching with Permanganate solution. Touching the macules with saturated watery solution of potasssium permanganate, twice or thice a day has been recommended, and appears useful. Later on touching only once daily may be enough.

The care of the eyes. The eyes should be looked after with considerable care and alertness, as only one eruption, or even careless handling without any eruption, may prove damaging. They should be bathed in warm boric lotion, or some such weak antiseptic several times a day. To prevent the eye-lids from getting stuck together, one may use liquid paraffin, after each antiseptic wash. In the presence of profuse discharge from the conjunctiva, application of sticks of silver nitrate to the conjunctival margins is generally useful. When corneal ulcer has developed, an ointment like the follwing may be used with some advantage.

Unguentum hydrargyri oxidi flavi gr. 4.
Atropine Sulphatis gr. 2
Paraffinum Mollis upto. oz. ½

to be applied to the eyes twice or thrice daily. Many cases of sloughing out of the cornea take place with total blindness from intense systemic toxaemia. In these eyes half to one per cent solution of methylene blue locally applied may be of some use, as preventive and curative of small ulcers on the cornea. An ophthalmic surgeon may be of considerable help in these matters.

Toxaemia, Delirium etc. Adequate hydrotherapy and warm immersion tub-baths with alkalies, say half to one per cent sodium bicarbonate and 0.2 per cent carbolic acid in bearably hot bath water, are soothing. Ice-cap on the head following each bath may relieve the delirium. Enough of water should be given to ensure about normal quantity of urine, this is of special use in keeping the toxaemia under some check. In the confluent type, during the stage of suppuration the patient is always very toxic, and warm alkaline tub-bath coupled with penicillin injection have been found by me to be of use. Ice-caps on the head day and night may reduce delirium. As regards drugs an ordinary alkaline mixture with ten to twenty grains of bromide or equal quantity of chloral hydrate and bromide may have to be given in excitable delirium. Injection of morphine and atropine may be required in cases, not controlled by the ordinary measures. Sulphonamides and penicillin should always be tried during suppuration.

Diet and nourishment. Liquids, as advocated under the treatment or other acute febrile disease, such as barley water, green cocoanutwater, fruit juice, glucose solution with lemon juice, butter milk, whey, lemonade and milk, milk and soda, are suitable. Plenty of cold water is soothing to these patients. Ice-cream may also be allowed provided it is well tolerated.

Later in the disease, as the appetite returns one may give, soft boiled rice with butter and salt or with buttermilk, mashed potatoes, bread and milk, puddings, etc. A normal diet is resumed gradually and cautiously. During the whole course of the illness, adequacy of all the vitamins should be kept up in diet or through vitamin concentrates.

Haemorrhagic and purpuric cases are almost invariably fatal in even a few hours' to a few days'. Penicillin injection may be tried.

Complications. They should also be managed in their usual lines as they arise. Abscesses, of the skin are probably the most important of complications.

"Dermol" for removal of pits spots and marks.

I have tried in numerous cases of pock pitting and stains caused by the scar of small-pox "Dermol" (strong) with excellent result in almost all. *Not only the dark or other stains are removed, even the depressions and pits become smoother after prolonged use.* All marks on the face or anywhere on the body caused not only by small-pox but also those caused by acne and other eruptions are very well removed by 'Dermol' which slowly and imperceptibly peels off the skin and causes hyperaemia and increases the local blood supply hence is a tonic of the skin too. Dermol (strong) may cause slight smarting sensation only for the time being but removes the marks quicker than Dermol— which is weaker and does not cause any smarting.

CHAPTER XX
RHEUMATIC FEVER

This is an acute specific disease characterised by fever, fleeting painful arthritis, rashes, peculiar acid sweat and amenability to salicylates with a special tendency to carditis.

Subjects of infection, climate etc. The disease is uncommon in infants and elderly, adolescents and young adults[1] are the most common subjects. There appears a certain predisposition in some families. Though the primary attack generally begins at young age, recurrences are not uncommon in advanced years. People with fair hair, skin and certain peculiarity, are said to be more susceptible than dark coloured persons. Damp, cold countries, are favourable places for this disease probably by predisposing to tonsillar affections. Great Britain appears to be worst sufferer from it. Damp, exposure, fatigue tend to precipitate attacks.

Source of infection. Tonsillar, intestinal, upper respiratory passage infection or other infections, scarlet fever etc , probably serve as the source of the incriminating strepto-

1. Mc. Sweeny, (1931). Arch. Dis. of childhood. London. p. 313-383. Dec. 1931.

cocci. (Streptococcus rheumaticus of Poynton and Paine[2]). According to Swift[3] and others this condition may be caused by a hypersensitiveness to streptococci or their toxin, originating from repeated low grade infection or persistence of the foci of infection in the body. When under suitable conditions streptococci[4,5] or their products are disseminated to the tissues, the latter over re-act and the characteristic picture of the disease results. Bersaques[6] thinks that in rheumatic diathesis an exogenous or endogenous intoxication may help by the development of the symptoms in persons having a peculiar faulty action of the liver.

Clinical manifestations.

Joints. A patient with sore throat, tonsillitis or marked constipation or appendicitis or with hidden or apparent sources of sepsis, may get a chill or chilly sensation, with pain in one or several of the joints such as the knee, ankle, wrist, shoulder, hip, neck, tarsus, meta-tarso or meta-carpo phalangeal joint and others. By twenty-four hours several joints are affected; they are painful, swollen and red. Synovial effusion may appear, notably in the wrists, knees and ankles. Less commonly affected joints are, sterno-clavicular, vertebral and interphalangeal. Fibrous tissues may also suffer and rheumatic nodules are not uncommon in the tendon sheaths and edges of bones etc.

Peculiarity. The peculiarity of this joint affection is, its fleeting character, leaving one joint completely normal, while affecting others. *Fever.* May rise upto 102°F or more. *Tongue.* The tongue is generally peculiarly but heavily coated and appears foul (blanket tongue). *Bowels.* Anorexia may be marked. Constipation is the rule and may affect the disease very adversely specially when protracted. *Urine.* Traces of albumin, in severe cases uro-erythrin of a brick-red colour may be present. Urates are common deposits. *Heart.* Very important vigilance is needed for this organ. In about fifty per cent of all cases

2. Poynton and Paine, (1900). Lancet. ii. p. 861, 932, Researches on Rheumatism—by the same workers, Charchet publication.
3. Swift, (1931). Amer. Heart Jour. p. 625 etc.
4. Coburn, (1936). Lancet. ii, p. 1025.
5. Schlesinger and others, (1935). Lancet. i, p. 1090.
6. Bersaques of Belgium, (1932). Jour. Amer. Med. Assoc. 98: April 23rd. p. 1490.

of acute rheumatic fever, acute endocarditis leading through recurrences in subsequent attacks to carditis and permanent crippling of the patient results, unless care and attention are bestowed to the recognition and proper management of this condition.[7] Strangely some standard bigger books on medicine and other workers have expressed doubt as to the presence of this disease in the tropics. It is common in Bengal and presumably all over India.

Clinical diagnosis of endocarditis may be made by about eighth to the twelfth day. The patient may or may not complain of palpitation. There may be pain in the precordium, notably when the pericardium is affected. The fever may show a little extra rise than usual and the resting pulse rate may be a bit too quick to explain. There appears a systolic bruit which may even show conduction towards the axilla with evidences of enlargement or not of the heart. *Leukocytosis.* Generally total white blood count between fifteen to thirty thousands is common. A secondary anaemia is also a marked feature of the disease. Quick sedimentation rate of the erythrocytes is common too. *Atypical cases.* They are common in children and articular manifestations may be singularly absent, but the heart is affected from the beginning, hence it demands special consideration. Chorea may also manifest itself.

Complications are. Carditis, skin rashes of various types, pleurodynia, hyperpyrexia, chorea[8] and others. The association of chorea with rheumatic fever is recently questioned by Coburn and Moore[9] (1937). *Course.* Uuder the present regime of full doses of salicylates, ten days to three weeks course of the disease is common. When the course of the treatment is relaxed early recrudescence may occur. *Relapse.* Relapses are very common in rheumatic fever as are the recrudescences. Relapses generally show all the manifestations of the primary attack, though the degree of severity may be variable. The greatest danger of these relapses is in rendering the condition of the heart worse, in successive attacks. Morbidity appears to be a greater danger than mortality.

Rheumatic Fever in Children. This demands special consideration in view of the fact that rheumatic fever in

7. Dhar, (1934). Medical College Magazine, Calcutta; Reunion No. June 1934. p. 117.
8. Coombs' (1924). Rheumatic heart disaese. p. 6.
9. Amer. Jour. Med. Sci. (1937). p. 197.

children is more often sub-acute and may even be insidious, with involvement of the heart. The articular manifestations may be absent altogether, while the heart is already badly damaged. Any vague pain in the body, or so-called growing pains, with sore-throat or any complaint of either palpitation, precordial pain, unduly quick resting pulse rate, or rashes, pain in the abdomen which cannot be otherwise explained,—associated or not with any extra rise of temperature, should prompt the doctor to examine the heart carefully and that from day to day. As the early findings are mainly objective, hence the importance of careful daily examination of the heart in a case of even suspected rheumatic fever, be it even of a mild or trifling nature. Recently sedimentation rate of blood is said to be of some significance to ascertain the activity of the disease. There may be some degree of leukocytosis.

TREATMENT

Prophylactic—sulphonamides may act as preventives—for details see page 32.

The principles underlying the treatment are—(1) to relieve pain and distress, (2) to control the activity of the causative agents, (3) to try to encourage the formation of the natural defences of the body and (4) to guide the patient through a judicious but slow and sure convalescence.

Rest. This is an invaluable item in the treatment. It is necessary because:—(1) the body-cells are busy in overcoming an intoxication, (2) repair being undergone in certain tissues coincident upon inflammation, (3) to prevent cardiac involvement rest is the next important factor to proper treatment by the specific drug.

Bed. See page 19 for details also. The bed should be of firm consistency though soft and elastic. The height and width should preferably be, wherever possible, as in the hospital type of bed. This helps easy nursing. Sagging of the bed causes discomfort. The drenching acid perspiration often requires thick but soft blankets for covering the patient as well as the bed. Thin flannel night dress is advocated for cold countries. For the tropical countries though flannel is suitable for the winter season, for the warmer months thin sleeping suit made of material which absorbs perspiration readily is to be used. This clothing requires frequent changing as it gets wet through perspiration. These garments should be so made that they

can be readily opened up without entailing any difficulty to the patient, having extremely tender and painful joints.

Room. See page 19 for details.

Diet. This should consist of diluted milk, its preparations like whey, butter-milk, cereals, bread, rice and its preparations. During the acute stage there is an increased acidity of the urine, and there may be some truth in the "acid diathesis" in producing rheumatic fever, hence the importance of giving citrates and citrous fruits in the form of sweetened acid drinks of fruit-acids, which are absorbed as alkalies, in addition of the alkalies taken in medicine For this purpose, each glass of milk diluted with half to equal amount of water containing about ten grains of potassium citrate per glass, sweetened with sugar or glucose, every two to three hours is used. The patient may be given three to four pints or about two seers of milk, or its preparations. Home made lemonades prepared of two lemons cut circularly, with salt and sugar to taste, in a pint of water, is often liked by young patients. Only two seers or about three pints of milk supply about nine hundred calories which are generally not enough to maintain the requirement of the febrile patient, hence the milk diet may have to be supplemented by either fruit juice, glucose, sugary materials, cream, cocoa etc., during the acute stage, and in the sub-acute states by soft boiled rice, typhoid bread, soups, fruits, eggs, fish, etc. One should remember that in these patients, there is much emaciation with loss of weight. Here comes the importance of a liberal dietary, to properly counteract the inanition. There appears very little justification, in denying during convalescence small portions of meat to a patient who enjoys it.

Fluid. For details see page 16 onwards.

Bowels. For details see page 15—constipation in fever.

It is worth remembering that the streptococci or other organisms specially those from the throat pass into the intestines and constipation means additional burden of absorption of toxins from the gut resulting in a worse state of the disease. Hence the importance of unburdening the system of this toxic load, thus giving it a chance to recover.

In bad asthenic cases mild aperients and effective enema of sufficient bulk of about two pints for an adult, and about one pint for an adolescent are required. Along with the salicylate mixture some suitable aperient may advantageously be added.

Sleep. This should be ensured by bromides, in ten to twenty grains. Veronal and medinal in two to five grains. in cases of cardiac involvement, paraldehyde in one to two drachms in either orange juice or syrup of orange, with a few drops of oil lemon, may hide the disagreeable smell and taste of the drug, and prove useful.

Local Application—of warmth on the painful joints is generally appreciated specially during the acute stage. Later on when the acuteness of the local inflammation is less, alternate hot and cold application scientifically known as *contrast bath* may be employed with advantage. This helps in the speedy recovery of the pain in the joints.

As regards liniment etc., one finds the stronger counter-irritants to be of better service than the milder ones. For this purpose all suitable counter-irritant liniments or embrocations may be used with efficacy. Of these wintogeno is strong and effective. A liniment decribed page 142 for pain in pneumonia may be used with relief. After the local application the joints should be kept covered by either flannel bandage or cotton wool wrapping so that local chilling is prevented. Fomentation of the joints by cotton wool warmed up, or application of cataplasma kaolini or antiphlogistine group of remedies, may do some good. A very suitable application is made by two drachms each of methyl-salicylate or oil of wintergreen, terebene, and oil of eucaliptus.

Specific Treatment. The best plan is to start with a brisk purgative, followed by twenty grains of sodium salicylate with double the amount of sodium bicarbonate with one drachm of syrup of ginger and aqua chloroform upto an ounce. This should be given every two hours for the first three to six doses, then every four hourly for another twenty-four hours, to be followed by six hourly doses for another twenty-four hours, then the dosage is made half, and given four to six hourly, till the condition of the patient improves. In most cases along with the above prescription about ten to twenty drops of extract cascara sagrada may have to be added per dose. Some prefer about ten instead of twenty grains of sodium calicylate. The natural sodium salicylate though pure is rather expensive, hence cannot always be used in general practice.

For an average case a prescription like the following may be used with advantage.

Sodium Salicylate	gr.	15
Sodium Bicarbonate	gr.	30
Extract Cascara sagrada liq.	m.	15
Tr. Belladonna	m.	3
Syrup Zingiber	m.	60
Chloroform water upto.	fl. oz.	1

one dose every three hourly for the first twenty-four hours, every four hourly the next twenty four hours, then six hourly the third day and later on.

A child of ten years may be given half the above dosage with advantage. Generally if any patient suffering from arthritis on full doses of sodium salicylate for forty-eight hours, with clean bowels, does not show any improvement, is almost certainly not suffering from rheumatic fever.

Those *who are sensitive should receive salicin* in ten grains. *These medicines should be continued at least for a full fortnight after complete cessation of the fever.* Later-on a tonic preparation like Easton's syrup or any other suitable tonic may be used with advantage. Vitaminous tonics are to be used during convalescence. Some recent workers are stressing on the use of vitamins A and C[10] in particular but this is yet an open[11] question.

Quinine. Quinine salicylate in five to ten grains, thrice daily is useful where salicylate alone is not very effective. Children tolerate it easily in five grain doses with alkalies, in syrup and water.

Anaemia. Anaemia is best combated by ferri et ammon citrate in ten to twenty grains, followed by dilute hydrochloric acid, twice daily after the principal meals. Other suitable anti-anaemics may also be given. In bad cases injection of liver extract may accelerate blood regeneration.

Convalescence. Convalescence has got to be very much prolonged, because of the risk of an easy relapse even when the patient is cured completely. The causative organism appears to have prolonged vitality and the patient should receive at least a fortnight's treatment after the fever has come to normal. Before allowing him to rise on his feet, the affected joints should be regularly massaged and anointed with the liniments mentioned above, thus pre-

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10. Rinehart and others, (1934). Jour. of Expt. Med. 59: p. 97.
11. Abbasy and others, (1936). Lancet, ii. p. 1413.

paring them (joints) to sustain once again the body weight. For this purpose warmth in the form of contrast bath, massage, etc. are of service.

Besides iron, good food, prevention of constipation. milk, eggs, fruits, butter, help in quick recovery. As a tonic a prescription like the following one may be of service.

Syrup ferri Iodide	m.	60
Quinine bihydrochloride	gr.	2
Ext. Cascara sagrada liq.	m.	30
Liquor Arsenici Hydrochlor	m.	3
Glycerine	m.	20
Chloroform water	upto. fl. oz.	1

one dose thrice daily after food.

Salicylates by other routes. Since oral administration is quite effective and there appears very little advantage in either rectal or intravenous medication, one does not advocate any other than oral route for administration of this specific.

Idiosyncrasy to salicylates. Generally most people tolerate this drug fairly well. Where there are signs of intolerance the natural preparation should be used and its effects noted. If still there is sensitiveness either salicin or quinine salicylate or neo-cinchophen may be used in proper dose and method. Mental depression may be a symptom of rheumatic fever and not due to sodium salicylate. But one should remember that poisoning is generally *seen when the renal or hepatic function*[12] *is defective.*

The symptoms are dimness of vision, buzzing in the ears, deafness, giddiness. There may be headache or vomiting which is difficult to control. The cardiac manifestations are small, slow and even irregular pulse. The heart sounds are feeble. The extremities may be cold and clammy, the patient looks extremely depressed. There are some grave symptoms damanding special and immediate care. They are slow and deep respiration with profuse urination or oliguria, and the patient dies in a condition indistinguishable from diabetic coma. As rheumatic fever of very toxic type may show some of the above symptoms, some workers are doubtful if moderate doses, say ten to twenty grains three hourly, may at all produce symptoms of poisoning. There is no doubt that there are cases of

12. Sara De Alzaga, (1937). Semana Media, 44; 14th January, 1937. p. 87.

intolerance to salicylates. It also appears that sodium salicylate is useful for the arthritis and pain but not effective against carditis. Indirectly however it may prevent cardiac damage by keeping the rheumatic condition under control.

Treatment of Poisoning by Salicylates. The patient should be induced to drink plenty of normal saline and glucose with citrates, say four ounces of glucose with three drachms of potassium citrate in a pint of normal saline.

In severe cases intravenous glucose and subcutaneous injection of insulin should follow oral saline and glucose.

To prevent relapses. Vaccine made from proper type of streptococci, or other suitably prepared vaccines of bacteria isolated from the throat and other parts of the patient, or the possible variants of the streptococci are being given intravenously[13,14] with promising results. For preventive use of sulphonamides see page 32.

Concentrated anti-scarlatinal serum. Eason and Carpenter (1937)[15] have used about thirty to fifty c.cm. of anti-scarlatinal concentrated antitoxin and consider the effects promising enough for more extended trial.

Hyperpyrexia. For details see page 22.

Complications. Pleurisy, pneumonia, pulmonary oedema, abdominal pain etc., should be treated on the general lines.

The question of tonsillectomy is discussed in the chapter on chronic tonsillitis.

Choice of occupation etc. These are very important points demanding care and thought of the medical man, but is beyond the scope of the present work. The question of forming colonies of rheumatic patients, with suitable occupation and so on is being considered by English medical men.

CHAPTER XXI
MUMPS
(Epidemic parotitis)

Diagnosis. Though common in persons between six to fifteen years, no age is exempt, except the immune elderly. The greatest number of cases appear to occur during the winter months. It may assume an epidemic character, may affect the people in schools, barracks etc.

13. Swift, (1930). Jour. Amer. Med. Assoc. 20th June. 1930. p. 2091.
14. Ibid, (1932). 98: June 25th. p. 2313.
15. Quart. Jour. Med., (1937). 6: p. 93.

Generally the incubation period is three weeks, though variation of fourteen to twenty-five days is not uncommon.

Infection spreads from the patient. But apparently healthy intermediaries or fomites may rarely transmit the disease.

Signs and symptoms. Swelling, more commonly starting from the left parotid, spreads to the right one. These may be the only complaints. A few however show signs of general infection with variable pains distributed, more or less, all over the body. The glands go on increasing in size for the first two three days forming an ill defined elastic swelling obliterating the sulcus between the mandible and the mastoid bone. This lifts the auricle away from the head in a characteristic manner. The skin may in rare cases appear red. The swelling of the other gland starting in a day or two, with some rise of fever, is highly suggestive of this condition. In rare cases the interval between the onset of swelling of these two glands may extend even upto three to five days.

The jaws feel stiff and there may be temporary loss of sensation of taste. Though not invariably present, sour foods provoke pain in the affected gland, and is thought to *be a significant symptom.* The submaxillary and the sublingual glands may be involved in a few cases, similarly also the cervical lymph glands may be affected.

Temperature. The pyrexia seldom rises above 102°F and subsides in a day or two. Completely afebrile cases have been noted.

Abortive cases. Many cases of mumps do not show any such symptoms as to establish a diagnosis, but all the same they confer protection.

Complication.

Orchitis[1]. By the seventh or eighth day of illness, these complications generally start affecting boys at puberty and in young adult life. The onset is with pain and tenderness in the testes. There may be associated with it grave nervous symptoms, high fever and even intra-abdominal symptoms. Generally these subside in a week's time. About fifteen to thirty percent may develop these complications and sterility may be a sequel.

1. Friedjung, (1928). Ziets. f. Kinderhielk, 46. p. 303.

In females the ovaries[2] may be similarly affected.

Pancreatitis. It is said to be more common in certain epidemics than in others. There is acute pain in the abdomen, vomiting and other symptoms suggestive of acute abdominal trouble[3]. Hence the importance of remembering the history of an attack of parotitis.

Other complications may manifest in the from of meningeal syndrome such as headache, photophobia, delirium and even stiffness of the neck.

Deafness, optic neuritis[4] and other complications may also be present . Encephalitis is reported[5].

TREATMENT

Prophylaxis. Three to four weeks' isolation should be enforced to contacts and the patient. The maximum infectivity appears a few days before the appearance of swelling of the glands. A preventive vaccine is being recently tried.

The patient should be strictly confined to bed. The incidence of orchitis is much lesser in those who are confined to bed till the possibility of its appearance is over. Prophylactic value of convalescent serum is doubtful.

General. The room should be airy, and ventilated. Good care of the mouth, nose, ears is always indicated. Bowels should be kept regular as is usual in all acute infections. Their movement once a day should preferably be ensured either by mild laxatives or by an enema. Tepid sponging, plenty of fluids are of use. *Diet* is given in the form of milk and its preparations. They may be given flavoured with the numerous flavouring agents used for the purpose such as, cocoa, tea, ovaltine, vitacup, vitavose etc.

Medicines. Organic arsenicals were injected with the idea that it is a spirochaetal infection. But this appears to be of doubtful efficacy. A mixture containing five to ten grains of sodium salicylate with double the amount of sodium bicarbonate and one to two grains of potassium chlorate per dose

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2. Ohlmacher, (1936). Jour. Amer. Med. Assoc. 106: p. 2053.
3. Martinelli, (1934). Pediatria 42: p. 1452.
4. McKaig and Woltman, (1934). Arch. neurol and, Psychiat. 33: p. 795.
5. Smith, (1937). Lancet, i: p. 754.

may be given every six to eight hourly. Sleeplessness or other symptoms need proper lines of management. Mouth washes and gargles are of value.

Local Treatment.

Heat. Dry heat in the form of hot cotton pads is often gratifying in the milder cases; hot water bottles are used with variable success. Small sand or salt bags, devised at home according to requirement may be utilised for this purpose.

Hot fomentations in form of hot compresses either by flannel or cotton wool may be efficacious. Before applying these on the patients'parotid glands, the degree of the heat should be tested by feeling with the palm, otherwise there is risk of burning the skin. They should be renewed as soon as are cold. Once these hot applications are over the glands should be kept covered by dry cotton wool.

Cold. Some patients find greater relief from cold than from warmth. Ice bags may be utilised for this purpose, the circular icebags being very convenient. All air should first be driven out of the bag and a layer of flannel should intervene between the bag and the skin of the face. Suitably devised ice-poultices may be used for this purpose also. In case nothing is available, a piece of ice wrapped in a towel may be applied over the swollen parotid at intervals of a few hours. Cold water compress may be of relief.

Contrast bath. The application of heat and cold alternately appears to be of greater use than either alone.

Local application. Local application of ichthyol, belladonna and glycerine over the inflamed gland may be of effect. But this is very messy, hence one has found the following, rather neat application, to be of service.

Ichthyol	gr. 120
Ext. Belladonna Siccum	gr. 10
Menthol	gr. 4
Collodion	upto fl. oz. one

to be applied on the glands every one to four hours. This black application as soon as it gets dried sticks to the skin, and is not messy. It has the advantage of not staining the clothes or the pillow of the patient.

Convalescent Serum. Teissier (1925)[6] used about twenty c.cm. of convalescent serum intramuscularly with some effect and the complications were less.

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6. Teissier, (1925). Bull. Med. 39: p. 349.

Treatment of complications.

Orchitis. Absolute rest in bed and suspensory bandages to support the inflamed testes are the most essential measures and very little else than these are required for the milder affections. In cases where suspensory bandages are not possible to be procured a suitably devised 'T' or other bandage may be utilised for the purpose. Pillows placed between the thighs with another to support the bended knees may form a resting place, though they have the disadvantage of curtailing the freedom of movement of the patient. Recently incision and drainage of acute hydrocele of mumps is suggested[7].

Dry poultice. Warmth in the form of dry cotton-wool fomentation wrapped with abundance of cotton about the scrotum retains the heat for a long time.

The time honoured application lotio plumbi et opii, or any such suitable application may do some good.

Ovaries, mammary glands and vulva may be affected in the females and demand rest, application of warmth etc.

Pancreatitis. Warmth or cold on the surface, at site of pain, limitation of diet specially of fat, may be useful. As the trouble is often transient there may be very little permanent trouble left.

Meningo-encephalitis. There may be headache, nausea, vomiting, even of a severe nature, slight rigidity of neck, Kernig's sign and so on.

Lumber puncture, ice bag on the head, rest etc. are of use.

Convalescence. Tonics, iron, arsenic, vitamins A, B, C and D in liberal amounts may be tried with good effect.

CHAPTER XXII
DENGUE FEVER

Dengue is probably derived from the Spanish word "denguero" meaning a dandy. This may have originated from the stiff and dandified gait and posture of the subjects of dengue suffering from severe aches and pains in the limbs.

It is probabhly caused by a virus[1] conveyed from human sufferers during the first three days of illness, by certain

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7. Burhans (1945. Dec). Jour. Urol. 54 : p. 547.
1. Hoffmann and others, (1932). Proc. Acad. Sci. Amsterdam 35 : p. 909.

species of mosquito[2]. The incubation period is commonly from four to seven days with extremes of two to fifteen.

The specialities of this group of fevers are[3,4] :—

Fever of short duration—minimum of one and rarely exceeding seven days.

The types of temperature may be of *continued type, saddle back type,* in which the temperature shows a fall on the second, third or fourth days after the initial fever to rise again by the fifth or sixth day, resembling the back of the saddle used in riding horses. The other type is the interrupted type with two phases, in this unlike the saddle back type, the temperature reaches normal once, to rise again.

No parasites are encountered in the patients blood; leukopenia of a progressive type, is common.

It differs from influenza, tonsillitis or other fevers of short duration, by the peculiar absence of any catarrhal characteristics diagnostic of the above conditions. The mortality in this disease is negligible.

Commonly the disease is prevalent in autumn. One attack confers some immunity and hence the subsequent attacks are milder and are of shorter duration. The fever generally of 102° to 104°F. lingers in the non-immune for seven days with slight intermission or complete remission in between. But in the immune subjects the duration as seldom more than three and a half to four and a half days. Rarely the whole course may last for one day only.

Pains may vary, but the typical case complains of severe aches and pains justifying Rush's name "break-bone fever." But in some epidemics they may be very slight or moderate.

Pains and aches etc. With the abrupt rise of temperature there is generally frontal headache, pain in the eye balls. There may be a flush, present all over the body of the patient, who in most instances complains as a rule of severe pain in the back and limbs. Recently altered taste mostly bitter and sour[5] in the mouth are complained of by dengue patients.

2. Siler, Hall & Hitchens, (1935). Jour. Amer. Med. Assoc. April, 18th. : p. 1163.
3. Rogers & Megaw, (1930). Tropical Medicine : p. 170.
4. Sarcorrafos, (1928). Ann. of Trop. Med. and Parasitol. Aug. p. 151.
5. Ewing (1944. Nov.) Med. Clin. North. Amer. 28 :

Rashes. By the fourth to the sixth day there may be a measly rash, seen in twenty to ninety percent of the patients, varying in different epidemics, in limbs, trunks and palms of the hands. They may persist for a few days after the fall of the temperature.

Other features. Slow pulse, leukopenia, nausea and vomiting, enlargement of the lymph nodes, depression of spirit are suggestive diagnostic points.

Diagnosis has got to be made from influenzal group of fevers commonly showing catarrhal manifestations, with a tendency towards complications, etc.

Measles, small pox and rarely rheumatic fever may be mistaken for this disease.

TREATMENT

The patient should go to bed and rest there till he feels quite well. A comfortable bed, in a well ventilated room, is useful. He should be encouraged to drink as much water as he can. Cool sponging during high temperature may be soothing. See also chapter on fever page 12 for general management etc.

Diet. During the acute stage, the diet should consist mainly of liquids such as fruit-juice, barley-water, glucose drinks etc. But later on, when the anorexia and nausea are better, milk preparations, soups, broths, milk and sago or barley, etc. are convenient forms of diet. During nausea, green cocoanut water, lemonades, milk and soda or glucose water with lemon juice, with a pinch of salt in it, may be gratifying to the patient.

Bowels. They should be kept open during the sthenic stage of the disease by divided doses of hydrarg subchloride at night, followed by some suitable salines, like saturated solution of magnesium sulphate, in half to one ounce, or Seidlitz powder, in suitable doses, in the following morning. But when first seen during the latter part of the illness it is better to be satisfied with simple enemata, as purgation may exhaust the already ill patient.

Pains and aches. For the pains, sodium salicylate in five to ten grains with double the dose of alkalies, phenacetin in one to three grains are of use. The recently introduced analgesics like veramon, novalgin, compral, may be given in two to three grains every four to six hours, when the pain is at its worst. In very severe pain morphine group of drugs may have to be used. A prescription like the following may be used every six hourly in bad cases.

Aspirin	gr	3
Phenacetin	gr.	2
Caffeine citrate	gr	1
Soda Bicarb	upto gr.	10

One powder every six to eight hourly. If to the above prescription about two to three grains of veramon or compral or novalgin, are added, the relief of pain may be satisfactory. For the night, to promote sleep, the caffeine should be withheld and half a grain of luminal substituted in its place. Pyramidon produces agranulocytosis, hence is risky.

Locally. Ice cap on the head, and ice applied on the eyes, may be soothing. For the aches and pains in the body, application of warmth and some anodyne or counter irritant liniment, containing methyl-salicylate, camphor and others may be used with advantage. Vicks' vaporub is good. Ozodine with methyl-salicylate is useful.

Nervous system and insomnia. The patient should be left alone, as visitors are often annoying. For insomnia suitable hypnotics are indicated, luminal, chloral or bromides may be suitable. Goldie, (1929)[6] regarded the symptoms like a protein shock, and advised calcium and adrenalin injections.

Complications are very few. Haemorrhages are not very rare, and deserve treatment in the usual lines.

Convalescence. It is surprising, how much delayed convalescence sometimes may follow such a trival illness. Good vitaminous diet, tonics like Easton's syrup, syrup minadex or ferradol may be used with advantage.

Prevention. All ways and means to prevent the breeding of the mosquitoes should be investigated and preventive measures adopted. Mosquito curtains are useful, and the patient should be kept under it from the beginning. For other measures special treatise should be consulted. Recently a virus injection is being given for prevention with some success.[7]

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6. Trans. Roy. Soc. Trop. Med. and Hyg., (1929). Jan; 30 : p. 385
7. Sabin and Schelesinger (1945 June. 22.) Science. 101. p. 640 to 642.

CHAPTER XXIII
PLAGUE

Diagnosis. During an epidemic of plague it is easy, specially in the bubonic type. But before or after an epidemic, notably before the presence of plague is suspected or known, a diagnosis may be extremely difficult.

The presence of rat epizootic in the overcrowded affected areas known to be endemic for plague and in the proper season should always arouse suspicion whenever a doubtful case occurs.

Laboratory examination. Generally one comes to a certain diagnosis, from the only sure test consisting either in a positive culture of the material derived from puncture and aspiration of the primary bubo which gets swollen and painful before the secondary glands are similarly affected, or by a positive cultural result of the blood, specially in septicaemic forms. Properly staining the material derived from puncture of a gland, and examining under the microscope, the diagnosis may also be arrived at. A leukocytosis varying from ten to forty thousand, with a polymorpho-nuclear preponderance is again suggestive.

Clinically. An irregular and high fever associated with toxaemia commencing almost immediately with the rise of temperature either preceded or followed by or associated with a painful enlargement, of the groin glands in a vast majority, though not uncommonly of the axillary or cervical primary buboes, should make one suspect the disease. Peri glandular oedema is almost always very distinct. Skin rashes, enlarged spleen, quick pulse of a small volume and low tension, often dicrotic, laboured, shallow and rapid respiration, rate varying from thirty to sixty per minute, an anxious expression, some time a flexed attitude have been described on the second or third day of plague, as the "pathognomonic picture which suffices for a ready diagnosis.[1]"

Septicaemic or fulminating plague. At the beginning of an epidemic, in the absence of bubonic, septicaemic cases, of plague, may present considerable difficulty in diagnosis. Season, death of rats in numbers, with a suspicious clinical picture, should arouse one's suspicion of plague. Positive blood culture and leukocytosis are points diagnostic of the disease.

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1. McCoy, (1925). Plague. Osler's Modern Medicine. Vol. 1. p. 600. 3rd Edition. Lea & Febiger Publication.

The onset is sudden, with high fever, delirium, prostration etc. Prodromata may or may not be present. All the symptoms are usually very sudden at onset and are very severe. Though no primary bubo is there, yet a generalised painful adenitis is often encountered. Prostration is very marked from the beginning and coma may supervene quite early in the disease. Severe persistent vomiting, bloody diarrhoea are frequent. The spleen is palpable, the pulse is rapid, of low tension and dicrotic. Death almost invariably results from eighteen hours to three days after the onset. Commonly cases are intensely haemorrhagic.

Pneumonic Type. Besides the above findings in the pulse, spleen, prostration and so on, there is in pneumonic plague sudden rise of fever with pains, headache, vomits and other signs and symptoms.

But the very quick rate of respiration, going even upto sixty to seventy per minute, cyanosis of a pronounced degree, prostration, forthy, bright blood-red sputum etc. are all helpful and suggestive points. Unless these are borne in mind and suspected, the diagnosis may be missed. But by staining the sputum, if the pasteurella pestis are encountered under the microscope and when recognised by the typical bipolar appearance, the clinical diagnosis is confirmed.

This pneumonic plague manifests itself in two varieties, one the bronchitic and the other broncho-pneumonic in type. It is highly contagious and spreads by droplets like wild fire and is almost invariably fatal.

Secondary Pneumonia, complicating bubonic plague generally develops from emboli or aspiration of infected material. Though the increased respiration rate and cyanosis are of no diagnostic value, as both occur in non-pneumonic cases too, but small areas of dullness, rales, giving the impression of affection of the superficial areas of the lung may help in the diagnosis.

TREATMENT

Prophylaxis.

Carriers. The patient should be *isolated, all secretions and excretions disinfected.* Unless he has an open and draining bubo, with pasteurella pestis in the pus, there is not much risk from the patient of bubonic plague. But if the house abounds in flea infected rats, the place is obviously very dangerous. Otherwise a case of bubonic plague by itself is not a very bad source of infection. The most dangerous is the pneumonic type of cases, which helps the

spread of the disease through droplets, with surprising rapidity. The sputum of septicaemic, and in pneumonia in bubonic type, may cause the dissemination of the organisms, though these bacteria die quickly when dried or exposed to the sun.

Rats. But by far the most important item in prophylaxis consists in elimination and destruction of rats by all means known.

When there is an epizootic in rats in an area known to be infected, the human beings, should preferably leave the locality and live either in the open or in other places where grains, food and drink of rats are not available. The rats will go to places where they can find food and water. The life of other rodents of the locality also need investigation to ascertain the likely possibility of their acting as carriers of the fleas.

Expert medical supervision of the sick and the dead would serve to disclose cases which otherwise would escape detection. A special hospital for suspected cases, may afford better facilities and serves to segregate the infected. Houses in which more than one patient or dead rats have been found, need not only fumigation, but disinfection is to be followed to exterminate all rats and for safety it is better to leave the house for a few days. Cargoes from infected ports may harbour infected rats, hence proper steps should be taken.

D. D. T. and Sodium fluoro-acetate for control of Bubonic plague[2]. 1. D. D. T. application on floors of every house. 2. Second application between ceiling and roof etc. 3. Third application of D. D. T. and raticide sodium fluoro-acetate, the latter in 1 in 1000 solution in water, and 5 in 1000 mixture in rolled oats and in dried cakes.

Four days after the D. D. T. application epidemic stopped. The fleas in the rat nests decreased rapidly. Sodium fluoro-acetate also brought about excellent results[3]. Though the above is based on a single experiment yet the results are promising enough for wider trial.

Prophylactic Inoculation. Plague vaccine prepared by Haffkine's institute of Bombay when injected confers some degree of immunity. The reaction is less severe now by

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2. Editorial (1946 Sept. 14.) Jour. Am. Med. Ass p. 83.
3. Maccheavello, Atilio (1946 Aug.) Am. J. Pub. Health. 36: p. 482.

modern vaccines than those derived during the earlier days of inoculation of plague vaccine. The dose is from half to two c.cm. or more every ten days. Those working in plague striken areas when properly inoculated only one percent got infected, whereas, in the un-inoculated controls the infection rate was six per cent or more. Recently[4] attenuated living organisms are being injected with good protection.

Curative treatment.

Sulphathiazole and Sulphadiazine in plague.

Mathur and Goyal (1945) treated bubonic plague cases with 2g of sulphathiazole initially to be followed by one g four hourly making a total of seven grams during the first 24 hours subsequently 4 g total daily for 4 to 6 days with a mortality rate of about 23 per cent as compared with 80 per cent in the controls.[5] Those who had nausea got nicotinic acid and alkalies orally, and glucose and insulin by injection.

Recently tendency[6] is to be give massive doses of sulphadiazine which appears better than sulphathiazole, both by injection and where possible by oral route, 12 g on the first day along with 2.5 g intravenously and 2 g 4 hourly till the patient is reasonable cured. Earlier the treatment is started the better is the result.[7] In a series the death rate was only 6.6 percent in those treated with adequate doses of sulphadiazine within first 24 hours of onset of bubonic plague. But when treatment is started after 24 hours the death rate mounts to nearly 19.67 per cent.[8]

Streptomycin is expected to have a specific action, for details see page 63, and the chapter on streptomycin page 62.

The old treatments by plague antiserum, bacteriophage iodine etc. given by injection have faded into insignificance in comparison with treatment started early with sulphadiazine. *Streptomycin has proved already a specfic for*

4. Otten, (1936). Ind. Jour. Med. Research 24; No. 1. p. 73.
5: Wagle, Sokhey et al (1941) Ind. Med. Gaz. 76 p. 29 to32.
6. Munter (1945. May 26.) Jour, Am. Med. Ass. 128, p. 281.
7. Simeons and Chhartre (1946 July) Ind. Med. Gaz. p. 235.
8. Shokey and Wagle (1946 Sept.) Ibid. p. 343.

tularaemia and is expected to be of great use if not a specific for plague.

General measures for details see chapter on fever. Strict isolation of the patient and disinfection of all secretions etc. should be perfect to prevent spread of infection.

The sputum in septicaemic cases may abound in plague bacilli, hence it is always worth taking rigid precautionary measures. The bouts of cough may spray out the bacilli to the bystander and so the need for care and use of suitable masks and other preventive contrivances. Pneumonic plague is very dangerous and droplets contain the bacilli to infect those exposed to the spray of the sputum.

The secretions, excretions, sputum, blood and discharges from the bubo are infective, and should preferably be burnt out instead of leaving to chance disinfection by chemical antiseptics. Boiling in permanganate solution may be an effective way of dealing with these dangerously contagious materials.

Fever. For the fever and hyper-pyrexia, cold packs and sponges are of use. Plenty of cold water taken freely is useful in reducing the toxaemia. See also page 12 onwards for details.

Bubo. Warm compresses may give relief. Glycerine ichthyol and belladonna applied locally and covered with cotton wool may be of some use. Less messy is a preparation prescribed in the treatment of mumps. The buboes should be opened up as soon as suppuration starts. Dressing the ulcers by saturated solution of magnesium sulphate and glycerine in equal parts is of use. Ichthyol and iodine dressing and powdering sulphadiazine have been also advocated. Potassium permanganate solution is also used as a dressing. Streptomycin dressing may be very effective, injection of this into the bubo may be tried with advantage.

Heart. For the heart, cardiac stimulants may be of service. Glucose insulin injections are sustaining to the organ. See also page 13 etc.

Sedatives. For the restlessness and toxaemia, plenty of cood water orally or saline subcutaneously or rectally should be given, so that the urinary output reaches about fifty ounces in twentyfour hours, for details see pages 14, 16 etc.

When marked restlessness develops morphine and atropine in 1/4 and 1/150 gr. doses respectively may have to be given to an adult. Rectally, chloral and bromide have

also been of use. They are generally employed to an adult for rectal use in twenty to thirty grain doses etc. and may have to be repeated.

In pneumonia or septicaemia with pulmonary complications inhalation of streptomycin spray may be of much use. For details see page 64. This is used like aerosol penicillin described on page 53.

CHAPTER XXIV
ERYSIPELAS

DIAGNOSIS.

It is an inflammatory disease of the skin due to haemolytic streptococcus infection, characterised clinically by local redness, swelling having a spreading margin, with a tendency to spread through the lymphatics, showing intermittent or remittent fever associated with prostration of a variable degree.

The infection, may start from the organisms residing in the nose and mouth. The face is the commonest site of affection, next come the legs etc. In a series, about eighty eight per cent were on the face and about eight per cent on the legs and feet.

It is inoculable and contagious. The common sources are the unclean hands, fomites, instruments, and infected persons. As a rule the nasal mucosa contain the organisms and may infect when local or general resistance is lowered.

Predispositions commonly are :—

Season. May occur at any time when the systemic and local resistance is lowered.

Age and Sex. It is common in newborn infants, one of the writer's cases recently occuring in an infant twenty eight days' old. Commonly it is seen between twenty to thirty years of age. Females are more affected than males.

Previous Attacks. One attack predisposes to recurrences. Debilitated persons, or persons with infected nasal cavity may get recurrences easily.

Debilitating conditions. Chronic diseases like tuberculosis, nephritis, alcoholism, heart disease, cirrhosis of liver, cancer, diabetes etc. which lower the resistance generally predispose to this infection.

Slight abrasions, fissures, cuts or scratches even when they are too insignificant to scrutiny, may be the portals of entry of the organisms.

Incubation. The period of incubation may vary from three to seven or even ten days.

Clinically Symptoms may be general and local.

General fever; onset of fever with chilliness or rigor, ranging up to 105°F. or more, continuous at the beginning, later tending to be remittent or intermittent in less severe cases, declining either by lysis or crisis, in about seven to ten days time are suggestive.

Pulse and Prostration. Pulse rate is accelerated, of good volume, but easily compressible having characteristics of septic pulse. The depression may be out of proportion in alcoholics, diabetics or in persons with debility.

Nervous Symptoms. Headache and nocturnal delirium are not uncommon.

Tongue. Tongue is usually heavily coated and nausea, vomiting are generally present. Constipation though the rule, rarely diarrhoea, may occur.

Lymphatics. Enlargement of the lymphatic glands draining the affected area is almost invariable; the spleen may be enlarged.

Metabolism. There is increased metabolism, even upto forty two per cent[1] above normal.

Local Symptoms. In facial type the starting point often is the bridge of the nose. It feels hot, tense, painful and sensitive to touch. Almost immediately a small red, swollen, shiny area of inflammation, with a tendency to creep out, develops. There is a line generally present separating the inflamed, red, angry-looking spreading affected margin, showing vesicles in the diseased area from the normal skin, just outlying its border. The inflammation may spread from the original focus on the face to the head, neck and scalp. In the fully developed case the swollen face, eyelids, ears and the peculiar tumid appearance may disfigure the patient beyond recognition. The same applies for cases of erysipelas of the legs.

Mucous membranes. From the skin the inflammation may spread to the mucous membranes of the pharynx, larynx,

1. Coleman, Barr and Du Bois, (1922). Arch. Int. Med. p. 567.

trachea, or even to the bronchi. Oedema of the glottis is not rare. The mucous surfaces may be the primary site of infection. There is in such cases intense pain, redness, swelling, with a sharply defined outline of the affected mucous surface. The lymphatic glands of drainage often show enlargement.

Complications, in order of their frequency are abscess, arthritis, lobar pneumonia, active delirium, phlebitis, pleurisy, acute nephritis, synovitis, diarrhoea, tonsillitis and so on.

Relapses are quite common.

Bacteriological. Culture of the material from the vesicles or from the spreading zone, or from the original site of affection may show the typical haemolytic streptococci.

Differentiation has to be thought of from eczema, urticaria, angioneurotic oedema. These show much less severe constitutional symptoms and are often afebrile and have their characteristic symptomatology.

Anthrax of the face may be difficult to diagnose from erysipelas.

TREATMENT

Prophylaxis. It is advisable to isolate all patients since there is risk of transmission by contacts. This is specially indicated for the sake of preventing spread to puerperal women and newborn babies, and persons with open wounds and debility.

In Hospital Wards. In the hospital they should also be isolated, if possible in a special ward. To prevent spread through the desquamating epidermis, a three per cent boric acid bath is advised.

Relapse. Measures should be adopted to limit not only the spread of the disease, but also for the prevention of *a relapse*. Relapses are probably due to auto-reinfection or a reinfection from outside sources.

The dressings, the fingers, pus or secretions and excretions, bed linen, clothes, as a matter of fact all articles which come in contact with the patient, should be disinfected and dealt with properly.

Doctors, nurses, attendants should all be careful of themselves and try to prevent the spread through them to other patients and healthy persons.

General Measures.—For details see page 12 and onwards.

Curative treatment.

Specific measures. Sulphanilamide in adequate doses (for details see page 25, and 26) has so favourably changed the outlook of treatment of erysipelas that all other old forms of therapy have faded into the back-ground.[2] Penicillin has made the out-look still brighter. *Erysipelas in the elderly and in persons of lowered resistance due to alcohol diabetes, cirrhosis, nephritis, etc. should preferably be treated by combined sulphanilamide and injections of penicillin for details* of which page 36 and onwards should be consulted. In erysipelas of children sulphanilamide in adequate doses acts like a specific.[3] I have treated a fair number of such cases with uniformly satisfactory results. As it is a recurring disease sulphanilamide medication should be continued for atleast one week after the fever has subsided completely. The fever may take 2 to 4 days to come down even after adequate sulpha therapy. *Injections of sodium sulphanilamide* or some such injectable product should always be given when there is any suspicion of faliure of absorption, or delay in action or the condition of the patient demanding immediate and urgent effect. Strepto-antitoxin may be tried but has not proved as useful as expected.

Local application—of saturated solution of mag-sulph and glycerine in equal parts, or clove oil—one percent, oil eucaliptus—5 percent, soft paraffin upto 100 parts may be of some use. Other areas of sepsis should be controlled.

General treatment. Plenty of fluids, good nourishing vitaminous diet, iron, arsenic, nuxvomica in the form of tonics; relief of constipation and of the symptoms as they arise, for the details of which the chapter on fever page 12 and onwards should be consulted.

CHAPTER XXV

SEPTICAEMIA OR SEPSIS AND PYAEMIA

Diagnosis.

Common Signs and Symptoms. The commoner signs and symptoms are usually intermittent pyrexia, the patient may feel exhausted, but the mental state may be optimistic.

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2. Nelson, Rinzler et al (1939) Jour. Am. Med. Ass. 112, p. 1044.
3. Snodgrass, and Anderson (1937) Brit. Med. Journal, July 17. p. 101.

Sweats, quick pulse, chill or rigor, steadily progressive anaemia, leukocytosis, the smaller the count the worse being the outlook, loss of weight, pain all over the body and specially in the joints etc. are important systemic manifestations.

In the presence of an infection, whether the local lesion is obscure or not, the diagnosis of toxaemia is not difficult. The severity is greater when the pulse is rapid and there is delirium, muscular tremors, incontinence, tympanites, meningitis, petechial rashes[2], stupor, all indicating very marked intoxication.

In old and weak persons there may be a deceptive clinical picture, the toxicity of the infection, in fact is more serious than the severity of the symptoms would seem to indicate. These are usually found in weak debilitated persons of past middle age or in the elderly, or may be diabetics, alcoholics, tuberculous, and specially with ascites due to peritonitis of tuberculous origin, subjects of, cirrhosis of the liver, chronic nephritis, heart trouble, cancer, etc. and as a matter of fact all debilitating conditions may render the body incapable to put forth a good fight when overwhelmed by virulent infection.

In the presence of a local suppurative lesion, dissection or autopsy or other wounds, post partum endometritis, otitis media or in any pus under pressure and various other septic foci hidden or apparent. or during the course of an acute infectious or septic disease, there develops a sudden exacerbation of the severity of symptoms in general specially if accompained by a chill, and sweat at defervescence the onset of bacteraemia is probable. Blood culture, if repeated several times is the best diagnostic aid in such suspicious cases, though a negative cultural finding does not necessarily minimise the clinical importance of such a case. Increase of polymorphonuclear leukocytes in the course of the disease may help by suggesting an additional burden on the system over and above the existing ones.

In one case, under the present writer's care, resulting in a fulminant type of staphylococcal fatal sepsis with hyper-acute osteomyelitis of the left clavicle bone, the urethral canal was found to be the original source of infection. The patient suffered from chronic gonorrhoea, which fact was kept back from us, all the while, till at the last moment, only to be divulged before death.

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1. Ruiz-Cortis, (1936). These de Paris. No. 590.
2. DesJeux, (1936). Ibid No. 823.

In relation to the circulatory system and anatomical distribution there may be three types of pyaemia. They are. 1. Systemic venous pyaemia 2. Arterial pyaemia which may be due to a left sided or right sided endocarditis. 3. Portal pyaemia. Terminal septicaemia is serious.

TREATMENT

Treatment of sepsis, pyaemia, etc. not infrequently taxes the practitioner's resources to the utmost, but one can proceed on some general principles.

Specific Remedies :—In *combined sulpha-drugs and penicillin therapy,* both by injections, due to their synergic action more or less we are in a position to successfully treat most of the systemic bacteraemias caused by cocci and others for the details of these the chapters on sulphonamides and penicillin should be consulted. *Combined therapy appears better than either alone,—see pages* 36, 37 *etc.* Streptomycin will prove effective in those cases where gram negative organisms are at the root of these bacteraemia, see pages-62 etc.

Treatment of the focal lesion is also of utmost importance for which the advice of a surgeon is of use. Draining of pus under pressure, removal of septic foci etc. are of obvious import.

Raise the resistance of the body etc :—In cases requiring prolonged treatment for some length of time there may be marked anaemia to be treated as usual by proper doses of iron, arsenic, purgatives etc. but when these fail or in urgent cases transfusion of 250 to 500 cc. of compatible blood may tide the patient over the danger period, with ultimate recovery. Thanks to combined penicillin and sulphadrug therapy, because they speedup recovery in most cases, thus the difficulties of transfusion are generally obviated, except in cases of injury, or after child birth etc.

For Genral Measures—like—rest, fluids dehydration, light, room, nursing, bowels etc. the chapter on fever should be consulted. Hyperpyrexia, insomnia, headaches etc. need proper management as discussed under fever therapy. In unconscious cases intra-nasal Ryles tube may save the situation. Sera specially antitoxic ones may be tried but are not of much use except in gas gangrene, tetanus,diphtheria etc.

Diet. While cases of virulent sepsis run a rapid course and are accompanied with anorexia, making feeding difficult, food need not be forced in such unwilling subjects.

Fruit juice, cooled glucose water with lemon-juice, or barley water properly salted and soured with lime juice, with or without soups made from vegetables or lentils, given at frequent intervals, may be liked. Soups tend to cause diarrhoea, and should not be exhibited to patients having loose bowels or showing much tympanites and so on.

In cases of some duration the theoretical need of at least three thousand calories should be considered. Milk preparations, eggs, bread, cereals, broths, soups, sweetened drinks, or preparations with butter or cream add to the caloric requirement of the individual. But it should be remembered that sugar, fats and soups may cause intestinal troubles and diarrhoea by upsetting digestion in some cases, where they should be withheld. Milk casein hydrolysates may be of much use.

Amongst Indian preparations--"Chira mondo" or "Khoi mondo" semiliquid preparations made from flattened or fried paddy or soft boiled rice with gruel, sago fruit juice etc. may be given. Vitamins should be adequately represented in the diet.

Later on when the patient's appetite and taste for food return one can give, some soft rice boiled, with live fish, or chicken (pishpash) or rice or bread, buttered or simple, eggs, fish, meat, butter-milk, soups, mashed potatoes. When there is no contra-indication, cold drinks, ice-cream made at home and when it is beyond suspicion of bacterial contamination, are suitable.

As is generally encountered, when the patient cannot take much at a time, it is suitable to feed him every two to three hours. The service and preparation should be to the taste and linking of the individual.

For children, puddings, baked custard, soft rice with gruel with minced meat, soups, jellies, pish-pash etc., are suitable.

For care of the mouth, tongue, teeth, skin, eyes etc. the corresponding chapters on typhoid fever should be consulted.

In convulsions treatment should be according to the cause. Chloral hydrate and sodium bromide, twenty to thirty grains each, given rectally in four to six ounces of normal saline, often tend to relieve the convulsions.

When the headache and the convulsions are due to excess of toxins, plenty of water by all the possible routes, to facilitate elimination, may be useful. Here too the amount of urine passed is a rough and ready guide as to the adequacy or inadequacy of internal hydro-therapy. When a person in health should pass about fifty ounces of urine, certainly the same amount of fluid and the additional amount required for metabolism, evaporation and insensible perspiration should be granted. This is a drawback and not uncommonly the cause of higher death-rate in cases of high toxaemia treated outside the hospital.

Convalescence. This should be managed as in enteric fever or other illnesses of long duration.

CHAPTER XXVI
TETANUS

Diagnosis.

It is an acute infectious disease whose, signs and symptoms are caused by the toxic products of the clostridium tetani.

After mild, severe or lacerating even trifling injuries with tissue damage, street accidents and injuries, tetanus is common. There are cases recorded in which breach of surfaces of skin cannot be detected (cryptic). After child birth tetanus may occur in the mother.

This disease is found all the world over, and was quite common during the last world war in soldiers wounded in the highly manured soil of Europe. The bacilli are commonly met with in manure, garden-soil, street-sweepings, putrefying liquids and so on. The spores retain their virulence for years, and may be carried by the wind and dust to wounds and ulcers, thus causing this severe infection. Recent investigation of the street soil of Calcutta has shown its general nature of prevalence.

Toxin. The symptoms are due to the action of the toxin elaborated by the organism at the site of infection.

Incubation period. The usual incubation period is from seven to nine days. But the extremes vary from two, three days to two weeks. The shorter the incubation period the more serious the disease is likely to be.

Symptoms. Prodromata such as, restlessness, headache, pain in the back, langour, and slight rigidity of the extremeties, may be present for a short period of a day or two. Then follows *lock jaw* (*trismus*), spasm of the facial muscles giving rise to the characteristic physiognomy, the face is immobile, the forehead is generally wrinkled, the eyes partly closed and drawn in, the corners of the mouth retracted and the lips protruded, producing the distinctive smile *risus sardonicus*. There may be *orthotonus, opisthotonos, emprosthotonos* due to spasmodic tonic preceded by clonic contractions of the systemic muscles, in which the arms generally escape.

Voluntary urination, defaecation become generally impossible. There is from time to time exacerbation of convulsive seizures with most agonising suffering, thorasic oppression, dyspnoea, and some degree of cyanosis. These convulsive attacks can often be induced by slight irritation as by touching of the body, a blast of cold wind, a sudden noise like the bang of a door etc. The reflexes are exaggerated and the sensorium remaining unclouded. Kernig's sign is early and almost constantly present.

Sweating may be profuse, leukocytosis of a moderate nature is common, urine shows variable albuminuria. Fever may from a moderate degree to hyperpyrexia specially late in the disease.

Complication. Such as pneumonia and nephritis may occur. During the sudden convulsive seizures rupture of muscles and consequent haemorrhage have been reported.

Types and Varieties of the disease may be of a *chronic* type besides the acute ones.

TREATMENT

This is divided under two headings.

(1) *Prophylactic.* Consisting of certain initial measures cleaning which all wounds specially of lacerated and crushed type, with the least possibility of being contaminated by soil, manure or street dust, dirt and others, demand. All compound fractures deserve this line of management. In tetanus adequate prophylaxis is by far the most important, effective and not uncommonly a life having procedure. See also pages 29 and 58.

(2) *Curative.* Once the symptoms develop and the diagnosis is suspected a line of treatment is taken which may not prove so successful as an adequate prophylactic

measure is likely to be. Hence the importance of proper prophylactic measures in all suspected injuries wounds, cuts, bruises etc. Street injuries are specially dangerous, prophylactic measures in all suspected injuries wounds, cuts, bruises etc., should be prompt and thorough.

Prophylactic Measures. The wound should be washed, irrigated, the foreign bodies or crushed bones, or dead tissues removed, drainage ensured and adequate dosage of antitoxin given. As the limit of the incubation period may extend upto three weeks, and the protection conferred by serum usually does not last for more than the maximum limit of about twelve days[1] though most workers hold that the protective action of serum does not last for more than seven days, it is advisable to give three weekly injections of fifteen[2] hundred American units of the antitoxin. (American units are double those of international units). A serum of dependable brand is nowhere so essential as in the prevention of this very dangerous disease. And no where, prevention is better than cure, as in this condition. Recently Brown (1937)[3] has suggested active immunisation by injection of toxoid, or alum toxoid. This is now extensively used specially in the army with good results. Once if toxoid is injected twice, one at the interval of 6 weeks the protection is usually adequate. It is often combined with T. A. B. in the army.

Curative.—

General. A somewhat darkened but well ventilated quiet room should be chosen, as sudden noise, loud talks, banging of doors or utensils, heavy foot-steps, are likely to precipitate these distressing clonic spasms, hence every effort should be made to exclude them. A soft hospital type, preferably a waterbed is of comfort. Warm baths and sponges should be undertaken very cautiously, as cold water may initiate the convulsions.

Feeding is not uncommonly very difficult and concentrated food such as egg, milk and glucose mixed together, fruit juice with glucose etc., may have to be given, later on, by the nasal tube. Rectal saline and glucose may be of service. But while feeding much care should be exercised to prevent suction of food materials to the respiratory

1. Miller and Rogers, (1935). Jour. Amer. Med. Assoc. 104: Jan. 19th. p. 186.
2. Klopp, (1936). Ann. of Surg. 104: p. 419.
3. Brit. Med. Jour. 1937. i. p. 494.

passages and thus development of aspiration pneumonia prevented. As the patient's strength is of great use for final recovery all effort should be made to conserve the energy by rest, prevention of spasm and good dietary and so on.

The Wound. This should be treated on the principles of aseptic and antiseptic surgery, draining ensured, and dead or lacerated tissues or foreign substances removed. Tincture iodine, hydrogen peroxide, carbolic acid touch etc., irrigation, drainage are of value. Once the symptoms are there, amputation of the limbs or the parts is useless as the toxin is already fixed in the nerve tissues and though amputation may prevent further absorption of the toxin, yet the amount already absorbed by the system, may be fatal. Moreover at the later stages of the disease the bacilli die out, hence again the futility of amputation of the limbs.

Some workers have advocated the local administration of dry tetanus antitoxin into the wound, after it has been surgically cleansed, this is said to be of special use in tetanus neonatorum in which the infection is through the umbilicus.

Micturiton and Defaecation. Owing to the spasm of the muscles of the perineum a catheter may be required for proper relief of the bladder. Much trouble may be experienced in getting a satisfactory evacuation of the bowels.

Antitoxin. Recently some American workers are of opinion that only intravenous serotherapy is quite good and adequate for the treatment of tetanus. The intravenous route, according to them, is as useful as intrathecal administration. This is the general view now.

Dosage. During the earlier part of the disease the maximum dose of antitoxin amounting even to two hundred to three hundred thousand units should be pushed intravenously notably in grave cases. Generally about two hundred thousand units should be given on the first day, the same dose, the next day, and then the dosage may be lessened to some extent. Most of this should go intravenously. Once the symptoms improve, intramuscular injections of twenty to thirty thousand units each may be given daily, in two twelve hourly doses. But in actual practice one has found that enormous doses of serum may be required to combat bad cases of tetanus. It is also worthwhile remembering that once the disease has developed the results of

curative treatment may not be so successful as the antitoxin treatment of cases of diphtheria, hence the repeated emphasis on the supreme importance of adequate prophylactic measures. The antitoxin must be of a dependable brand.

During the Convulsions. For immediate relief of the convulsion, *chloroform anaesthesia* of a mild type may prove useful. Some workers think that chloroform itself has got a curative effect hence should be given daily. But repeated chloroform inhalation, has given rise in a few cases to secondary bronchopneumonia, due to improper breathing and aspiration of infected material from the oral cavity. It is very difficult to keep the mouth clean due to spasms and lockjaw. Where available, gas and oxygen may be given with better results than chloroform.

Chloral hydrate has a depressing action on the anterior horn cells of the spinal cord, lowering their power of conducting the impulses. Hence it is an ideal antidote to this disease. But as choral hydrate is a depressant to the heart, it should always be used with care. For an average Indian patient about twenty grains of chloral hydrate and thirty grains of *potassium bromide* in four ounces of normal saline may be given high up in the rectum, by drip method, to be followed up every four to six hourly by about ten grains each of the drugs in the maintenance dose.

Curarine. Mitchell[4] (1936) has reported successful treatment of a case of tetanus by subcutaneous injection of one milligram or about 1/64 gr. of curarine free from curine. The solution should be freshly made every few days. It has got a property of lessening the spasms and the reflex irritability[5]. The margin between the effective antispasmodic dose and that which produces paralysis of the muscles of respiration is so narrow, and as the drug's action as a rule does not last for more than half an hour, this drug is not safe to be used by doctors who are not experienced in its use. On the contrary avertin[6] has been advocated recently in sixty to eighty mg. per kilo of body weight, repeated every few hours as its effect passes off and is always worth a thorough trial. See page, 29 and 58 for details of sulphonamide and penicillin therapy respectively.

Sulphate of Magnesium. Intrathecal injections of about two to four c.cm. of a twenty-five per cent solution of chemi-

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4. Lancet, (1936). Feb. 2. i, p. 262.
5. West, (1932). Proc. Roy. Soc. Med. 15 : p. 39.
6. Medical Annual, (1937). Tetanus. p. 461 to 462.

cally pure magnesium sulphate solution on alternate days are of use in relieving the spasm of cases of tetanus. To be effective this treatment should be started very early in the disease. Twelve per cent and twenty five per cent magnesium sulphate solutions in fifteen c.cm. doses are given intramuscularly, every twelve hours, with good results.

The following summary of Cole (1936)[7] for the treatment of tetanus is of value, and is worth following.

(1) As soon as the diagnosis is made give two hundred thousand units (international) of the antitoxin per vein.

(2) One hour after the antitoxin has been administered, proper surgical treatment should be given to the wound and irrigated with hydrogen peroxide.

(3) Keep the patient as quiet as possible in a darkened room. If reflex spasms have not begun, give large doses of bromide and as much of a fluid or semifluid diet as possible.

(4) If the period of onset is four days or longer and the reflex spasms are not severe the treatment by *avertin* need not be started at once, but should be begun if the spasms are severe and exhaustion appears. In such a case one basal anaesthetic dose may be sufficient.

(5) If the period of onset is three days or less, treatment with avertin should begin at once, and continued according to the severity of the spasms. In cases of prolonged spasm causing respiratory embarrassment, the dosage should be large and frequently repeated.

(6) With avertin treatment oxygen should be given intranasally by the catheter and atropine injected as required.

(7) Enemata, injections, rectal salines etc., should preferably be given when the patient is under the influence of avertin.

(8) Avertin treatment may be continued as long as necessary, gradually the dosage should be reduced.

(9) Cool or tepid sponging is generally useful in hyperpyrexia.

Juhnke (1937)[8] referring to the experimental investigations regarding the therapy of tetanus by Saegesser (1935) where the lowest morality in tetanus has been possible, suggests the following methods :

7. Brit, Med. Jour. (1936). i, p. 1191.
8. Surg. Gynaecol and obst., (1937). 64 : p. 600.

(1) Combined intravenous and intra-lumber injection of the serum, intra-lumber injection during chloroform anaesthesia. (2) Combined avertin, serum, atropine therapy. (3) Intraspinal injection of twenty five per cent magnesium sulphae solution in forty per cent glucose. (4) Administration of chloral hydrate and somnifene. (5) Administration of alkalies, glucose and insulin, with oxygen inhalation.

CHAPTER XXVII

CEREBRO-SPINAL FEVER

Diagnosis. Over crowding, besides others is an important factor in the spread of this infection. Poverty, insanitary living, contact with persons having infections of the respiratory tract, overwork, fatigue, exhaustion, etc. in history are suggestive. In India it is common[1] during hot months and in young adults.

According to Horder[2]. "The chief difficulty lies in not suspecting the presence of the disease[2]. With this point one can not but agree, specially this remark holds good at the time of absence of an epidemic.

Clinical Feature. In the study of the clinical features of the disease, "the meningeal phages of meningococcic infection are so dramatic and arresting that they have fixed the attention of the clinician to the exclusion of the study of the more obscure but no less important extra meningeal features. The results has been a narrow conception of the disease as a meningitis only, a late diagnosis and a relatively ineffective therapy."[3]

Though the clinical features vary but generally the average case of the disease has got three stages which are.

First Stage. This stage lasting for a few hours to several days, manifests symptoms indifferentiable form those of a cold in the head, and sore throat, but may show toxaemia. The throat swab shows plenty of meningococci on

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1. Russel, (1936). Bull. de l'Off. internat. etc. 1936. 28: p. 1106.
2. Horder, (1933). Cerebrospinal fever. Text book of Practice of Med. Edited by Price, 4th edition. p. 159.
3. Herrick, (1926). Osler's Modern Medicine, Vol. I. Chapter 12. Meningococcus infection. p. 573. Lea and Febiger's Publication.

culture, as yet the infection is mainly local. This toxaemia, absent in ordinary catarrh, is suggestive.

Second Stage. This is the stage during which organisms have disseminated to the systemic circulation. This may take place from forty-eight hours to several days or weeks following the primary stage.

The inflammation of the upper air passages, coryza, pharyngitis, tonsillitis and conjunctivitis persists and the oral secretions are thick, viscid and even ropy. The temperature in over three hundred cases was on the average 101°F. During this stage children may show repeated convulsion. *The subjects of meningitis lie listless to their surroundings in a peculiar huddled up posture and on their sides with the knees drawn up and the head bent forwards.* There are generally pronounced aches and pains all over the body, sometimes with involvement of the joints. Not uncommonly in the very fulminant cases the patient becomes stuporose and speechless, and dies with a low blood pressure due to haemorrhage in the adrenal glands.

There may be a petechial rash present most commonly, near-about the shoulder and the pelvic girdle, and reports by writers suggest a proportional severity of the disease in relation to the severity of these rashes. Haemorrhages under the skin are not uncommon in very severe cases Meningococci have been repeatedly successfully cultured from these cutaneous lesions.

A very important point diagnostically, with exception of lobar pneumonia is, in the early and very definite leukocytosis, varying generally from sixteen thousand to about fifty thousand, of which the polymorpho-nuclears range, near abut ninety percent.

During this stage there may be a positive blood culture showing meningococci.

Third Stage. Then comes the third or metastatic stage and that in about ninety per cent of the cases. The signs and symptoms are characteristic of affection of the central nervous system.

Headeache of a bursting nature, vomiting which persists even after the acute stage of onset is over, are very suggestive points diagnostically.

There appears by the third or fourth day of disease some rigidity of the neck. On attempting to flex the retracted head on the neck the entire body may be lifted up like a log of wood.

Kernig's Sign. The inability to extend the leg at the knee, when the thigh is flexed at the hip is positive.

Brudzinski's Neck Sign. Consists in flexion of the thigh and legs when the head is attempted to be flexed on the chest. On attempting at flexion of the head, there is *not only active protest from the part of the patient but also there is dilatation of the pupils.*

There may be the typical peculiar distressed cry, the socalled hydrocephalic cry.

Of the cranial nerves the third, sixth and eighth are commonly affected, leading to variable types of strabismus, too, may help in the diagnosis

The following are useful diagnostically.

(a) If delirium and headache synchronise, meningitis is probably present and not mere toxaemia. (b) If vomiting persists after the initial invasion stage of the disease being undoubtedly over, then there is evidence of meningitis. (c) A relatively slow pulse, in the possible absence of typhoid fever, as compared with the temperature, or irregularities in rhythm are in favour of meningitis. Slow pulse is also met with in influenza and small-pox. (d) Stiffness of the neck, in the absence of any local and painful disease of the neck, meningitis is probable. (e) Optic neuritis, is not an early symptom but fundus may show unusual fulness of the veins and blurring of the edges of the discs, and these are important suggestive findings. So in short the diagnosis depends on the 1. History, 2 The clinical picture and culture of the throat swab and blood, 3. Leukocytosis, 4. Syndrome of meningeal involvement, 5. Lumber puncture findings, 6. Cytology and culture result of the cerebrospinal fluid.

During lumber puncture.—

1. There is increase in the pressure and amount of the cerebrospinal fluid. 2. The naked eye appearance of the fluid varies from slight opalescence to a frank purulent character. 3. The albumin and globulin content are much increased. 4. The characteristic cytological change is, in an increase of lymphocytes quite early in the disease, a fact often misleading to the novice and worth remembering, later on, great increase of polymorphonuclears, nearing about 70 to 80 percent. 5. Bacteriology of the fluid, is very characteristic. Direct smear or a centrifuged deposit when stained generally show the typical intercellular diplococci. 6. By proper culture of the fluid and thus isolating the organism.

It must not be forgotten that lumber puncture is the only sure means of diagnosis, it helps to ascertain the nature of the organism and helps materially in the treatment.

Complications.—

Psychic and motor defects of various types and affections or of special senses may be met with. Blindness and deafness may also occur.

Arthropathies. Arthritis is quite common, they are of varying grades of severity. The writer saw in several fatal cases of meningitis haemorrhagic effusions into the joints, in presulphadiazine days.

TREATMENT

Prophylaxis. The same principles of prophylaxis, as adopted for all infectious diseases spread by droplets, hold good here too. *Though usually it is more by a healthy carrier that the disease is spread, yet the patient should be isolated and contact with others avoided.* The average period of incubation is about seven to fourteen days and all contacts should be kept under observation at least for a fortnight. Open air life is very suitable to render the contacts and the temporary carriers free from the organisms, thus making them harmless.

Contacts and carriers should receive sulphadiazine orally see page 32 bottom for details, also page 27.

Prophylactic vaccines, though have not proved their worth statistically, yet when prepared of organisms isolated from virulent local cases, (polyvalent vaccine) are worth trying for prophylactic purposes. For this half to one billion killed organisms may be injected subcutaneously, once every five to seven days, till three such are given.

During the season and specially when cases are occuring, one should always avoid such minor infections like rhinitis, tonsillitis, pharyngitis etc. which thus afford opportunity for the meningococci to gain a foot-hold locally and thus to cause the disease; sulphadiazine in adequate doses, prevents its development. See page 32 for details of this.

Secretions and Excretions etc. All these should be carefully gathered and burnt out, specially all oral and nasopharyngeal secretions. Utensils, towels, bed linens etc. should be regarded as dangerous and be properly sterilised.

Curative Treatment.—

Specifics,—sulphadiazine in adequate doses and at proper interval acts like a specific and according to many is the therapy of first choice[4] in cerebrospinal meningitis. For details see pages, 27, 32 etc. *Penicillin* has also been found quite useful, but requires both parenteral and intrathecal injections, with inherent dangers[5], recently reported, *resulting from frequent intrathecal injections of concentrated solution of penicillin.* For the details of usual penicillin therapy see page 54 etc.

For meningitis due to other organisms than meningococci—simultaneous use of sulphadiazine or thiazole coupled with penicillin afford better result than either alone, tor details see pages 51 onwards.For streptomycin therapy in meningitis see pages 64, 67 etc.

N. B. Dangers of intrathecal penicillin therapy :—

Too frequent and concentrated solution of penicillin given intrathecally caused adhesive spinal arachnoiditis leading to complete flaccid paraplegia in some and is reported very recently. According to workers in the line the probable factors responsible for toxicity in short have been (1) Too much concentration[6] of the penicillin given *intraspinally*[7]. *Stronger solution than one thousand units per c.c. as recommended by the Committee of National Research* Council appear risky : (2) Slow diffusion of spinal fluid[8]. Dehydration in the patient may be contributory to this. (3) Size of the individual dose. *Usually 5 to 10 thousand units in 5 to 10 cc. or more diluted may be generally adequate daily dosage.* (4) Not more frequently than once a day, (5) and should only be continued as long as vitally necessary. They prudently conclude "greater reliance should be placed on early treatment with maximuu doses of parenterally injected penicillin and that when possible intraspinal administration be avoided". *Hence penicillin*

4. Stainsby, Foss et al (1944. Nov.) Pennsylvania. M.J. 48. p. 119 to 125.
5. Erickson, Masten, Suckle (1946. Nov. 9.) Jour. Am. Med. Ass. 132. p. 561.
6. Siegal (1945. Octo. 20.) Ibid. 129. p. 547.
7. Sweet et al (1945. Feb. 3.) Ibid. 127. p. 263.
8. Russell and Beck (1945 April. 21) Lancet. 1. p. 497.

should never be given intra-thecally with a light heart,[9] *but with great judgement and caution*[10].

General measures. The patient should be isolated in an airy and quiet room. There should be protection against strong light. The bed should not be on the floor, specially to facilitate lumber puncture a comparatively high bed is of advantage. Unnecessary disturbances are to be avoided. In cases of delirium and boisterousness the patient should be restrained by either a railing-cot or by other suitable devices, but tying of the violently delirious patient is cruel, and where unavoidable, should be taken resort to carefully and without hurting him. Boards of wood properly fastened round the bedstead serving as railing, may well restrain the patient.

Headache etc. This is sometimes ably combated by ice cap on the head. The pains, aches and stiffness are suitably treated by warm baths at temperature of near about 102° to 104°F.

Dehydration. At autopsy the cases show marked dehydration, hence fluids should be granted to these patients very liberally. For details see pages 16 and onwards on fever.

Diet. This should be limited to liquids, such as fruit juice, milk preparations, glucose water, green cocoanut water, dry milks properly prepared and so on. When there is desire and according to the taste and liking of the patient, mashed potatoes, custard, icecream, cereals, soft boiled rice, tea, cocoa etc. may be allowed.

As there is much loss of weight due to the fever, toxaemia, etc. and also in view of the fact that the course of the disease may be prolonged due to relapses, one must try not only to keep up the nutrition of the patient but also try to conserve energy by giving the patient proper and adequate rest, and by good nursing which spares all efforts. For details of Bowels, etc. see pages 12 onwards.

Treatment at the Carrier or first Stage and 2nd stage is best done by sulphadiazine, see page 27 for details.

The Second or the Septicaemic Stage is best treated by sulphadiazine see page, 27.

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9. Lubin (1940. Aug.) Arch. Neurol and Psychiat. 44. p.409.
10. Walker and Johnson (1945. Jan.) Arch. Surg. 60. p. 69. also Jour. Am. Med.. Ass. (1945 Jan. 27) 127. p. 217. and also with Kollors (1945. Dec.) Sur. Gynec and Obst. 81. p. 692.

Treatment of the third or the metastatic Stage by sulphadiazine see page 27.

Dry lumber puncture. Not uncommonly in very severe improperly managed dehydrated cases of undoubted meningitis, at the later stages, lumber puncture does not bring out any cerebrospinal fluid or only a few drops of thick purulent matter. In such cases not only oral administration of plenty of water is of use, but the recently introduced method of forced spinal drainage may also be of distinct service.[11]

This consists in intravenous administration of 0.45 per cent saline, about one pint, for an adult. The hypotonic saline has a tendency to permeate into the diseased areas of the system, here the cerebrospinal cavity being the site of inflammation, it can readily find its way therein. Now, if a lumber puncture is made, it is likely to be of use by proper drainage of the cerebrospinal cavity wherein the hypotonic saline has permeated.

Kubie (1928)[12] treated meningo-encephalitis in experimental cats by washing out of the perivascular exudate in sub-arachnoid spaces, by adopting the above method.

Retan (1932) has reported after applying forced spinal drainage for about two thousand hours on twenty-two patients. This line of work may be specially taken up with profit by those hospital workers in India who admit many patients of nerve diseases including cases of meningitis.

Cisternal puncture. Nowadays, in cases where lumber puncture does not give satisfactory results, or for better therapy, cisternal puncture is being utilised. This requires practice and should not be undertaken by any one who is not conversant with it.

Ventricular route of serum administration may have to be taken resort to in the cases of children.

Lumber puncture every day and serum introduction after draining of pus was the routine in pre-sulphadiazine days. But since sulphadiazine, and in rare cases of penicillin therapy intramuscularly and intra-thecally better daily, after the diagnostic primary lumber puncture, the next lumber puncture need not be generally done before 48 hours and that to watch the progress of therapy on disease. During these punctures, when on sulphadiazine

11. Retan, (1932). Forced spinal indrainage etc. Jour. Amer. Med. Assoc. Sept. 3rd.
12 Kubie, June, (1928). Brain, 51 : p. 244.

therapy, only a few c.cs. of fluid should be withdrawn because too much drainage of this sulpha-rich fluid will be a loss to the therapeutic efficacy. Subsequent punctures are to be done according to indication, but on experience was found usually unnecessary.

Complications should be treated by sulphadiazine and penicillin, as well as, by local measures, according to indication.

Convalescence. The patient should be carefully isolated, till the carrier stage is over. For rendering him free of the carrier stage by sulphadiazine an open air life, tonics, anti-anaemic vitaminous products like ferradol, syrup minadex, codliver oil, food containing fruits, milk, eggs, butter, meat, vegetables etc. in suitable quantities according to the appetite desire and liking of the patient are useful helping a speedy recovery and cause a rapid gain in weight and thus shorten the period of convalescence. Change to a better climate may help to hasten up recovery.

CHAPTER XXVIII
ACUTE ANTERIOR POLIOMYELITIS

It is an acute, specific febrile disease, occurring sporadically and sometimes in epidemics, in young children mostly in the second to the fifth year of life, though no age is exempt. It spreads probably by droplets, almost surely by a virus[1] through the infected persons or carriers. Recently sewage and other sources have shown the presence of the virus, and may be the infecting agent. "The pharynx thus appears to be an especially favourable site for the primary penetration of poliomyelitis virus in to the body"[2].

That the virus travels by some components of the nerves or by the nerve itself, specially by the mucosal ending of the 5th nerve is proved by the fact, that if the nerves at the site of inoculation of the virus is severed, the infection[3] does not take place. The virus does not seem to travel by the blood stream or the cerebro-spinal fluid, but

1. Hurst, (1930). Jour. Pathol and Bacterial. 33 : p. 1133.
2. Hor'stman, Ward and Melnick (1944. Dec. 23.) Jour. Am. Med. Ass. 126. p. 1061-1062. Editorial (1946. Nov. 23) Ibid. 132. p. 716.
3. Jungeblut and Sprin, (1930) Proc. Soc. Exper, Biol. and Med. 27 : p. 1076.

through the nerves only. It is more common during the hotter months of the year. The incubation period varies from one to four days. In the blood there is a polymorphonuclear leukocytosis which may reach even upto thirty thousand per cubic millimeter, during the acute febrile state. In the cerebrospinal fluid there is from a moderate to a definite lymphocytosis. All the lymphatic tissues of the body generally undergo hyperplasia.

This is a disease probably affecting a very large portion of the urban community; perhaps less than one percent of the persons infected develop paralysis and are diagnosed.

Neutralising antibodies have been found in the serum of fifty to eighty per-cent of the adolescent and adult population. To-day the teaching is that from the first entry of the virus by the nose, poliomyelitis is a nerve-cell disease, the initial symptoms are now regarded as indicative of the march of the virus from nerve-nucleus on its way to the cord. It is believed that the *First stage* of the disease actually includes three characteristic manifestations of a specific character[4], namely (1) inversion of the sleep rhythm; (2) general hyperesthesia to touch and movement; and (3) vegetative disturbances—sweating, flushing, tachycardia, and disordered intestinal peristalsis. According to Faber[5] (1933) most of the symptoms are due to lesions of the thalamus and hypothalamus, because these nerve-centres are amongst those to be infected first.

The symptoms developed during the *Second stage* are the spinal, ataxia, tremor, and weakness. Now-a-days they are regarded not due to meningeal irritation but due to extension of the disease by way of the spinothalamic tracts to the spinal ganglia and posterior horns. The *third* stage of poliomyelitis with the onset of flaccid paralysis, represents the final implication and destruction of the anterior horn cells of the spinal cord. The cases vary considerably in their rate of extension from one stage of the disease to the other. The abortive cases seldom advance beyond the first or second stage. "The so-called polioencephalitis[6,7]. The fever seldom lasts for more than seven days. It may usher in with chill in adults and convulsions in infants and children. The flaccid type of paralysis more commonly of

4. Medical Annual, (1937). p. 551. Poliomyelitis.
5. Medicine, (1933). 12: p. 83.
6. Hurst, (1935). Lancet. ii. p. 697-758.
7. Hurst, (1936). Brain, ix, 1.

the legs than of arms begins generally from the end of the first week and recovery may not start usually before the end of third month. Those cases which retain tendon jerks inspite of the paralysis, usually recover completely. In variability of symptoms this disease stands unique. There might not only be symptoms due to involvement of the spinal cord, cerebrum, or meninges etc., and a combination of these may be also encountered.

Differentiation has got to be made from acute rheumatic fever, Landry's paralysis, haematomyelia etc.

TREATMENT

Prophylaxis. In the acute stage the patient should be isolated and all precautions against droplet infection adopted for atleast a fort-night, after the subsidence of the temperature to normal. There may be encountered a variety of manifestations of the same disease in different persons of the same family, hence the importance of keeping all cases isolated. Recently much work is done on the preventive value of one per cent zinc sulphate solution[8] applied to the nose. It is a good prophylactic.

For convenience, the *treatment* is divided under three stages.

Acute Stage. The patient should be kept in an airy well ventilated room, *resting in bed all* the while in the most convenient and *comfortable posture.* As in all other acute febrile conditions the diet should consist *mostly of fluids.* Plenty of liquid drink is useful. In the presence of acute pain during movement a water or air bed, *and immobilisation of the limbs* by splints may be of distinct service. *Application of warmth* may give the patient considerable relief. *Pains and aches* are favourably influenced by either aspirin or sodium salicylate in five to ten grains with double the quantity of sodium bicarbonate per dose. Phenacetin and veramon, in one to two grains each, may be exhibited with some relief when the pain is very intractable. All these remedies may be given every four to six hours. *Lumber puncture* may b tried in all cases showing marked pains, and when under pressure the withdrawal of the cerebrospinal fluid may relieve symptoms. In bad cases eukodal or morphine and atropine may have to be tried. In the presence of paralysis of the respi-

8. Peet, Echols and Richter. (1937). Jour. Amer. Med. Assoc. 108: p. 2184.

ratory muscles atropine or belladonna in suitable doses combined with lobeline, strychnine may be of service.

Urotropine orally in five to ten grains to younger children, repeated every four to six hours, or every twelve hours, five c.cm. of a forty per cent solution intravenously, may help in either aborting or favourably influencing the disease. *Sera* of the specific type is of use when given before the involvement of the nerve fibers. But this is as a rule not possible unless in an epidemic, hence the once expected results are not achieved in practice.[9]

When the paralysis is extensive with the involvement of the muscles of the thorax, head, neck etc., a great care should be exercised in feeding the patient, and this is best done through a nasal tube. The patient needs be kept at rest for about five to six weeks, an iron lung may save life.

Curare for pain, rigidity and spasm etc.[10]

Recently intramuscular injection of curare commercially known as *intocostrin* (*Squibbs*) in 0.9 mg per kilo of body weight doses, if required to be repeated the next day or later on according to indication has been of great relief to the young patient. The case reports appear quite encouraging. "It appears to prevent acetylcholine from acting on the effector substance of the muscle"[11]. After the pain is relieved stretching exercises are carried beyound the point of pain with full length stretching out just short of tiring the muscles. Injections of *prostigmin* are also advocated.

Kenny Treatment :—Sister Kenny's (Australia) treatment roused so much medical opinion for and against her method that it is not possible to refer to them even. She contended that symptoms of poliomyelitis were due to muscle spasm, inco-ordination and mental alienation.[12] The treatment starts from the acute febrile stage, by hot packs for hours and active movements etc. are encouraged and asked to be undertaken. No massage is given. Re-education of the muscles are continued so long as the muscle tenderness and spasm continues. This form of therapy has much support in America but not so much in

9. Hurst, (1932). Jour. Amer. Med. Assoc. 99 : p. 1050.
10. Ranshoff (1945. Sept. 8) Jour. Am. Med. Ass. 129. p. 129.
11. Ranshoff (1946. May. 2) A paper read at the Meeting of Med. Soc. State of New York.
12. Pohl (1942) Jour. Am. Med. Ass. 118. p. 1427.

England[13] and some other countries, where the neurologists do not find much rationale at its base, and get no better results than by old orthodox therapy.[14]

Stage of paralysis.

Muscular relaxation in the position of physiological rest, at least for three weeks avoiding all movements, is an important item in the treatment. Light celluloid splints which may be easily removed for massage and passive movement, prevent contractures by stretching of the limbs. The opinion of a surgeon may be of value at this stage as to the position of maximum comfort and so on.

Warmth. Not only the patient should be kept warm day and night by proper garments, but also warm baths, local application of heat, hot douches may be of service.

Movement and Massage. This may be commenced with advantage as soon as the fever leaves and pain on movements is gone. In about a fortnight to five weeks time gentle massage and passive movement may be started.

This movement, first passive, then against resistance, is the normal physiological stimulus for the proper growth and nutrition of atrophied muscles, hence should be done regularly as soon as the pain and fever are gone. Local warmth, counter-irritant liniments may be of much use.

Electricity suitably applied may prove of some use.

Tonics. Containing iron, arsenic, nux-vomica and vitamins are of service. Strychnine in Easton's syrup or liq. strychnine hydrochlor in two to four minims not only improve digestion and appetite but also help easy conduction of the nerve impulses and thus in restoring function.

Late Contractures are treated mostly by surgical procedures such as. (1) division and transplantation of tendons, (2) resection of joints, (3) mechanical supports and (4) amputation in very badly altered cases.

Preventive inoculation. An appreciable immunity develops, when a formalised vaccine is injected in children but how far this may be applicable in practice is doubtful.

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13. Stewart (1944) Proc. Roy. Soc. Med. 37 : p. 235.
14. Key (1943) Surg. Gynec. obstet. 77. p. 389.

CHAPTER XXIX

EPIDEMIC ENCEPHALITIS

(Lethargic Encephalitis)

Diagnosis. The majority of cases occur during colder months and at the first half of adult life, though cases are recorded in persons of seventh decade. It is not uncommon in India.

This moderately febrile illness more commonly diagnosed initially as influenza,[1] is only definitely established after a few days to two weeks time. But sooner or later the characteristic syndrome of lethargy pronounced during the day, not uncommonly inversion of sleep, with active nights showing feverish activity alternating with inactive days, a dull mask like face, rigidity, nuclear ophthalmoplegia obstinate constipation, sometimes sialorrhoea, etc. help in the diagnosis, notably at the earlier stage of the disease. Later on, tremors, peculiar Parkinsonian syndrome with rigidity, loss of associated movements, more marked or present only on unilateral half of the body, are highly suggestive of epidemic encephalitis. Early bilateral ptosis is an important diagnostic point. Incontinence of the sphincters is the rule and may be due to lethargy.

There may be involvement of the pyramidal tract leading to loss of abdominal reflexes,[2] increased tendon jerks, and extensor planter response. These cases may simulate multiple sclerosis. Neuralgia and neuritic phenomena may complicate the clinical picture. Focal spinal lesions are not uncommon.

Cerebrospinal fluid shows lymphocytosis in majority of cases.

Negishi and Omori (1936)[3] described an epidemic in Japan with milder manifestations such as fatigue anorexia, chilliness, headache, gastric pain, diarrhoea, impairment of vision, pain in the eyes, violent heat in the soles of the feet and so on.

1. Romberg and Bremer, (1929). Munch. Med. Woch. p. 570.
2. Pakozdy, (1928). Deut, Zeitsf Nerven heilk, 103: p. 309
3. Bull. de l'off. internat. d'Hyg. publ, (1936) 27; 28. p. 847.

The post-encephalitic psychic changes and alternation of the mind demand special and sympathetic consideration.[4]

This condition may have to be distinguished from hemiplegia due to various causes. The degenerative form of paralysis agitans, has got to be differentiated from this post-encephalitic Parkinsonian syndrome.

Death rate during the acute stage according to Hall[5] (1935) is about 25 to 39 per cent, being more fatal in the elderly than in the young. Pregnancy makes the outlook of an acute attack unfavourable.

TREATMENT

Medicinal.

As little is known about the etiology of this condition, specific treatment is not possible at this stage of our knowledge. Six daily intravenous injections of a ten per cent solution of sodium salicylate in sterile normal saline, increasing initially form two and a half to seven and a half c.cm. may be tried. Fixation abscesses produced by the subcutaneous injection of a few minims of some such irritant like, T. C. C. O. (turpentine, camphor, creosote in olive oil) has been extensively tried with variable result. These abscesses are opened up when they point towards the surface of the skin. Hexamine in ten to fifteen grains orally every four to six hourly may be of use. It may be given per vein every twelve hours care being taken to avoid irritation of the urinary tract. Injection of electrargol has got its advocates.

General measures, nursing etc. As in all acute infectious diseases, here too good and capable nursing, an open well ventilated room, avoidance of the obstinate constipation may be of service. Retention of urine in the bladder during the acute stage of the disease due to profound lethargy may require careful catheterisation at regular intervals with careful aseptic precautions. Quinine in four to five grains twice a day or in three grains thrice daily may help in reducing the fever. Cryogenin and aristochin in two grains each, every six to eight hourly may help in reducing the temperature.

4 Tannenbaum, (1936). These de Paris, No. 177.
5. Lancet, (1935). ii. July 20th. p. 147.

Rigidity of the neck and a positive Kernig's sign, coupled with lethargy and drowsiness indicate a lumber puncture. For sleeplessness veronal, medinal, ortal etc., in two to four grains may be tried. Restlessness demands chloral hydrate and bromides in ten to fifteen grains of each, every six to eight hourly. Atropine in 1/100 gr., with equal or half the amount of hyoscine may be useful in not only combating the restlessness but also may relieve the tremor rigidity etc. But in some cases hyoscine may produce excitement instead of rest.

For pains and aches omnopon in one third to one fourth grain doses may be tried when coal-tar groups of analgesics fail to give reasonable relief. Kraus (1928)[6] reported favourable results in three cases, by subcutaneous injections of the patient's own blood, in gradually increasing amounts, where other measures failed to do any good.

Post-encephalitic Parkinsonian synarome, is treated mainly by atropine, hyoscine and stramonium group of drugs. They may be given orally or by injections. They act best on the rigidity, but upon the tremor, they appear to show very little effect. Hyoscine and atropine are given by injection in doses already indicated. Given orally hyoscine in 1/100 to 1/50 gr. and the tincture in ten to twenty drop doses, three times a day, may prove effective.

Extract stramonium (U.S.P.) in 0.05 gram orally increased up to 0.25 gram thrice daily, where well tolerated, the bigger doses are given with some effect. This preparation of the U.S. pharmacopeia may be of service in some cases.

Genoscopolamine[7] in four mgm. doses in the maximum or some such preparation may be used with advantage.

There is often dryness of the mouth, blurring of vision due to paresis of accommodation which are treated by adding about 1/16 gr. of pilocarpine nitrate per dose of the above remedies. These medicinal measures may be continued for a long time, in quantities just short of unpleasant reactions, but generally with enough salutary effect to ameliorate most of the troubles of the patient.

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6. Munch. Med. Woch, (1928) p. 1205.
7. Lados, (1927). These de Lyon, (1927-28). No. 47.

Belladonna group and Benzidrine or Amphetamine (B.P.C.) Tablets.

According to Davidoff and his co-workers[8] *rabellon* tablets (Sharp and Dohme) an effective extract of *Bulgarian belladonna* root, one fourth tablet thrice daily for the first day or two, then half a tablet thrice daily to be increased gradually till one tablet thrice daily coupled with one tablet of amphetamine in the morning, in some cases 2 such all in the morning, or large doses of stramonium with amphetamine has been found useful in Parkinsonian syndrome post encephalitic[9] or senile. The *amphetamine* reduces the mental torpor and makes the patient more cheerful, but in excess and when given after the noon, may cause sleeplessness. In over dosing insanity even may follow.

CHAPTER XXX

NASO-PHARYNGITIS

"Common Cold"

(Acute and Chronic)

This affection commonly known to the lay public as "cold in the head" with sore throat is rather infectious.

It is generally a droplet infection caused probably by a filtrable virus. Though the nasopharyngeal muscosa is teeming with all types of organisms yet we do not usually get symptoms of disease unless we are exposed to some source of infection. Some times acute rhinitis may accompany or usher in the advent of either influenza, measles, or some such systemic disease. Lowering of resistance by chilling, of the body, or wet feet and clothes, exposure to cold, draughts etc., are often the predisposing factors. General causes of debility, sudden alteration of temperature of the surroundings of the person, all are contributory causes.

Diagnosis. Generally though the symptoms are local yet they are usually associated with malaise and some times general aches and pains. In the severe forms, besides the above group of signs and symptoms, a definite rise of body temperature is the rule. The stuffed nose, the

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8. Davidoff (1940) Am. Jour. of Psychiatry N.Y. Nov: 97: p. 589.
9. Forster (1939 Octo) Pennsyl. Med. Jour. 43: p.67.

sense of obstruction there in, the thin watery nasal secretion that soaks the handkerchief easily, congested red pharynx with soreness, and difficulty in swallowing, the heavy head or the headache, conjunctival congestion, with the above systemic findings complete the picture.

But it should be emphasised, that the seriousness of such an attack lies in the fact that it lowers the threshold of general and local resistance specially of the respiratory passages, so that bacterial infection becomes easy, and if the infection of the upper respiratory passages creep down, bronchitis and other serious lung troubles may follow.

The economic importance of this trifling ailment is great, also loss to work and labour is considerable.

TREATMENT

Preventive—Vaccines and Vitamins.—As most of the recent workers doubt in the preventive value of prophylactic vaccines[1] and A & D vitamins[2] in common cold the indiscriminate advocacy of these as prophylactic measures is not justifiable. These infections spread very easily hence the patient out of his civic sense should avoid others.

Abortive effect of spray of Patulin[3], *Tyrothricin and Prothricin* in the throat, nose etc. given every 2 to 4 hourly for 24 to 48 hours aborted a good percentage of our cases. Prothricin (Sharp & Dohme) having propadrine added to it, usually is better where allergy and local congestion is suspected. Penicillin as aerosol or fine spray applied on the larynx, pharynx, and sniffed up the nostils has also a similar effect. In a controlled series of cases 58 per cent had cold aborted and finally recovered in contrast with 94 per cent suffered in controls[4] after 48 hours of local therapy. Hence this should certainly be tried as an abortive treatment wherever possible. The earlier the spray given the better is the result. See also pages 53 and 69 etc.

1. McGee and others (1944 Feb. 26.) Jour. Am. Med. Ass. p. 555-557.
2. Crampton (1944. Jan. 15) Ibid. p. 162-166.
3. Amer. Year Book of Medicine (1944) p. 34.
4. Raistrick and others (1943. Nov. 20) Lancet, p. 625-635.

General. If seen early in the infection, though most of the patients do not consult a doctor for nasopharyngitis, yet he should be asked to go to bed or must take rest. This procedure not only tends to cut short the disease but also the risks of complications are thus minimised. Result of treatment with the patient resting in bed is satisfactory too. These patients are very infectious, hence they should try to avoid visitors and should refrain from work and thus prevent spread of the disease.

A hot sponging, care being taken not to get chilled at the latter part of it, followed by a warm foot-bath, is often useful. This can be made up best, either by mustard or simple hot water. The mustard bath is prepared by dissolving one table-spoonful of good mustard in a gallon of water having a temperature of near about 105°F But for ordinary purposes the bath is prepared by putting one table spoonful of mustard in half a medium bucketful of warm water. The temperature can be best judged by the feeling of the patient in the feet, initially it should be just comfortably warm, then gradually hot water may be added. To immerse the feet in the bath from seven to ten minutes usually is sufficient. Then having the feet been wiped dry the patient should go to bed and put on warm clothing in the winter, and suitable dress in the summer. Hot water bottles at the cold feet and if the patient feels chilly, warm drinks may be of some relief.

There is a special tendency to undue perspiration in these cases, specially in the summer months and during the rains. This tends to make the clothing get drenched, and if fans play on the patient, there is a risk of aggravation of symptoms. Under such cases a reasonable temperature of the room and repeated change of the wet clothes, the patient being made dry and powdered properly, are useful to prevent catching of cold. He should be in bed so long as the symptoms persist. Sometimes the patient is unwilling to take rest. But if it is explained to him that at the early stages the efficacy of one day's rest is equivalent to that of three or more days later on and that he is also likely to escape complications, when so explained unless very hard pressed, the patient will comply to take rest.

For aches and pains, sleeplessness, headache etc. See pages 22, 23 etc. If the running from the nose is profuse 2-4 gr. doses of Dovers powder 2-3 such at bed time may be of relief. But it tends to dry secretions hence may

cause a sense of tightness in the chest by drying up secretions. Due to its constipating after effect, laxatives have go to be given the next morning or along with the powder. Half a gr. doses of phenolphthalin in mild cases or one fourth gr doses cf aloin till 2 such are taken may be suitable. *Inhalation of* one dram each of oil pine, oil eucaliptus, with two ounces of tincture benzoin compound in steam is often soothing. This should be repeated every 4-6 hourly.

Other local sprays and applications which were used formerly except patulin, tyrothricin better prothricin for aborting the infection have proved more or less useless.

Later on when the secretions dry-up washing with warm alkaline saline may be useful. Mistol, endrine, anaquintine etc. Chloretone inhalant (P.D.) etc. may also give relief.

When febrile, and associated with other signs and symptoms of systemic infection, the advisability of the use of *penicillin and/or* of sulphathiazole should be serious ly considered. They are indicated in complications also.

The commonest *complications* are the affections of the respiratory tree, either through spread by contiguity or by other means.

Antral involvement, sinusitis, otitis-media are also not uncommonly seen specially in the younger subjects.

Local Treatment. At first washing with a warm weak alkaline saline, like the one of Dobell's solution, to be followed by an oily application like the one in the prescription already given is of service. When the nasal discharge is offensive, a weak antiseptic like potassium permanganate solution one in thousand, may be usefully employed as a local wash to be followed by a solution of some silver salt such as protargol or argyrol or silver nitrate. If silver nitrate is used the strength of the solution should be about three to eight percent. When the organic silver salts are used the strength should be of about five to fifteen percent. The strong silver paints of throat should preferably be given only once a day and by the doctor himself, care being taken, to apply them uniformly all over the affected parts.

Prophylaxis good hygienic measures. open air life, sleeping in rooms with doors and windows open, good food with adequate vitamins, avoidance of excess, chill, and keeping of the body resistance high puts off illnesses of

these types. Special care should always be exercised to avoid exposure to droplets through sneezes, coughs, talks etc. Infected handkerchiefs, linen, towels, dishes. cups etc. may spread the disease, and hence one should be careful.

Chronicity.

Teeth, tonsils, adenoids when infected tend to cause chronicity of these conditions and they should always be properly dealt with. Chronic gastro-intestinal disturbances, unsuitable dusty occupation, sudden variations in temperature, abuse of tobacco, over-use of the voice may help to keep an infection lighted up and render it chronic.

Symptoms are chronic rhinitis or rhinopharyngitis, irritation of the nose and throat, with or without discharge. Voice is generally improper; there may be incrustations in the nostrils. Aching or discharge of pus from the ears may be met. Digestive disturbances are not uncommon. The mucous membranes may appear dry, glazed, or congested. Sometimes there is considerable swelling so that it is difficult to inspect the upper portions of the post-nasal space.

Treatment. The most important item in the treatment is that of general hygiene. Penicillin and/or sulphadiazine might have to be thought of specially when febrile or with complications.

Clothing. The clothing should be such that the temperature of the patient is kept as even as possible. He should be careful against chills or colds, also against heat and drenching perspiration. *Baths.* When made used to cool or cold baths, starting initially from tepid ones, may help not only by promoting the circulatory activity, but also by reducing the patient's susceptibility to cold. Regular cool sponging of the body once a day may help too in the same way. *Ventilation.* The ventilation of the bed room should be adequate, specially at night. *Exercise.* If the patient is used to a sedentary life, he should be insisted to take regular physical exercise in the open air whenever possible.

Diet. Diet should not only contain all the proximate principles, but contain also adequate amounts of all the vitamins. Regular use of some good brand of codliver oil twice or thrice daily with or without milk may be of use. When the daily diet includes a cup of milk, an egg, some

fruits, and a little butter, the recovery has been found to be easy and quick. Constipation should always be avoided. In these chronic cases Angier's Emulsion or similar preparations may do good.

CHAPTER XXXI

ACUTE TONSILLITIS

Acute or repeated infections of the tonsils are very potent sources of lowering the resistance of the patient, and they, not uncommonly, become a menace to the integrity of many remote organs and even endanger life. The infecting organism in the majority of cases is streptococcus haemolyticus[1] but there may be streptococcus non haemolyticus, staphylococcus or micrococcus catarrhalis etc.

Symptoms & Diagnosis. The onset is often abrupt with chill or slight chilly sensation followed by fever, headache, general muscular pains like those in an influenzal attack. The tonsils are swollen and red, the crypts may be plugged with thin membrane-like material, or pus may be found in them. Often the sites of the plugged crypts appear as white spots and this is called *follicular tonsillitis*.

The differential diagnosis from a diphtheritic throat is often very difficult and only way of diagnosis may be by microscopical examination of smears from the throat swab and also by cultural findings.

The characteristic of a typical tonsillitis is in an exudate of yellowish colour, separated by a deep red mucous membrance giving a patchy appearance and confind to tonsils. It can be removed without causing any bleeding.

The diphtheritic sore throat on the other hand, has a membrane of ashen or pearl gray colour. It is firmly adherent and when separated leaves a raw bleeding surface.

But it is of great importance to remember that a tonsillitis may be the expression of rheumatic fever, diphtheria, or an early sign of scarlet fever or Vincent's angina or the precursor of an infection of the respiratory system or syphilitic throat or agranulocytic angina or leukaemic ulcer etc.

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1. Solvogt and Crowe, (1926) Jour. Amer. Med. Assoc. March, 23rd. p. 962.

The face may be flushed, with a hot burning skin and quick pulse.

Dangers. Acute tonsillitis is not a trival condition, and one should always bear in mind the possibility of involvement of the remote organs, like the heart, kidney, or the joints etc. The patients should always be forced to stick to the bed till he is reasonably safe.

Avoid contact. Children who are susceptible to sore throat should be kept away from the patient.

Culture etc. In all suspicious cases the throat swab smear should be carefully examined under the microscope and a culture done. Whenever in doubt and there is any remote possibility of the case being one of diphtheria, penicillin and antiserum should always be pushed.

TREATMENT

Specific.

The question of *Sulphathiazole or diazine* in suitable doses and intervals—as detailed on pages-25 etc. and penicillin as detailed out on pages 53 etc. need be considered, specially in severe cases.

Diet. The pain in the throat often compels the patients to take only liquids or semisolids. Barley water, sugarcandy water, soft rice, sago and milk; decoction of lentils, fruit juice, mashed potatoes with milk sweetened, sago or flour or rice boiled with milk sweetened or simply as it is, with salt, are suitable Indian preparations. For those who take a mixed diet, custard, jellies, ice-cream, puddings, pish-pash, soft boiled egg or egg flip etc. may be freely given. Hot food and drinks are more soothing than cold things.

Sometimes in tonsillitis there is much loss of weight and hence the caloric need of the patient should be very carefully satisfied, and as much food as the patient can take, granted.

Drink. Soups, tea, coffee, plenty of water, or any suitable drink like hot lemonade etc. are liked by the patient. Juice of sweet fruits is also not painful to take, and should be given liberally to furnish adequate amounts of "C" vitamin.

Drugs. Sodium Salicylate (natural) in five to twenty gr. with about one to two grs. of pot-chlorate with double the amount of soda bicarb is a good prescription. Often, at the beginning of the attack, when the pulse is full bounding, quick and the action of the heart very forcible a prescription like the following may be of use.

Tr. aconite	m.	1
Soda Salicylas	gr.	8
Soda Bicarb	gr.	20
Pot chlorate	gr.	1
Syrup orange	m.	60
Cinamon water	upto. fl. oz.	one

One dose every four hours.

Coal tar preparations like phenacetin, antipyrin, and also the more recent analgesics like veramon in about five gr. doses may be given.

Mouth, teeth etc. For details see pages 20 etc.

For the average case and for poor patients a hot solution of alum with a little oil gaultheria and peppermint dissolved in a small proportion of rectified spirit may form a good mouth wash and gargle for the inflamed tonsils. The following is a useful gargle.

Formalin	m.	120
Absolute Alcohol	m.	120
Chloroform	m.	60
Oil gaultheria	m.	10

thirty drops in half a glass of water, to be used as a gargle.

Sponges.

After tepid sponging the hair of the patient must be carefully dried up by a dry towel or by some suitable dry cloth etc. Powdering of the body after sponging is soothing and tends to keep the skin clean and dry, preventing cutaneous troubles.

Local Treatment.

Abortive. By local spray of patulin, tyrothricin and penicillin one may try to abort the infection.

Gargles and sprays.

As regards gargles sprays etc. Mandl's solution and other local applications prescribed for sore throat may be used with advantage. Gargling becomes very difficult at

the later painful stages. Children, can not as a rule gargle at all, hence the usefulness of sprays or local paints. Inhalation of vapour of tr. benzoin co. may be soothing. The following having resorcin and phenol as its active contituents may be used with advantage.

Resorcin	gr. 40
Phenol	gr. 10
Spt. Menthpip	m. 15
Glycerine	upto. fl. oz. one

to paint the throat as directed.

Pain in swallowing. In painful swallowing the following method (Hovell) may be of some relief. The attendant should stand at the back of the patient, pressing tightly with his upwards pointing fingers and palm, the sides of the patient's head over and below the ears. As soon as the patient tries to swallow, the pressure is increased as much as possible and the auricle pushed upwards. This pressure often enables him to swallow with comparative ease, who would, due to excessive pain, otherwise refuse to take any food.

Hot compresses. Hot compress or fomentation over the surface of painful and sore areas in the throat is often gratifying. *Locally Cataplasma Kaolini* as a hot counter-irritant application may be of some comfort. *Adenitis.* Sometimes there are variable degrees of involvement of the lymphatic glands specially of the cervical regions. These at the angle of the lower jaw may also be affected. For this purpose, cold application in the form of ice or ice-bag, the former covered by a flannel or towel may be of use. Direct and too long contact of ice may be damaging to the skin. Ichthyol applied several times a day in the following form on the inflamed glands may be of relief.

Menthol	gr. 4
Ext. Belladonna siccum	gr. 10
Ichthyol	gr. 120
Collodion	upto. fl. oz. one

To paint over the glands four to six times a day.

The application has the advantage that it is not messy and as it sticks to the skin closely when dried, it does not stain the clothes. It is a useful local application and is as effective, if not more so, as ichthyol, glycerine and belladonna paint. The latter is very messy and often unmanageable.

Arthritis. Rheumatic fever with fleeting arthritis may be met with and is fully dealt with in the chapter on rheumatic fever. Sodium salicylate in big doses, with purges etc. are effective.

But for infectious arthritis, one should consult the chapter on arthritis.

Fibrositis and myositis may also follow an attack of tonsillitis which usually gets better under local application of some counter-irritant liniment and with the disappearance of the acute symptoms of tonsillitis under big doses of sodii salicylate.

Nephritis. At the height of the infection there may be febrile albuminuria without material damage to the kidneys. But there may be acute nephritis too. The varying grades of anaemia and slight swollen appearance may suggest, regular and careful daily examination of the urine leading to the diagnosis of nephritis.

Otitis media. In young children the course of this complication may be more or less painless demanding careful and daily examination of the ears. When there is indication the drum may have to be incised. Sulphadiazine and penicillin are worth a trial.

Pain in the Ear. For this dry heat in the form of fomentation by salt bags, heated over a fire or lantern may be soothing. The ears should be protected from cold, blasts of wind and preferably kept covered by flannel binders or handkerchief. Cotton pulgs should be used for the ears while sponging or giving bath to these patients.

Discharging ear. One form of treatment is to apply something like the following by drop method.

Glycerine Acid Boric	m. 180
Rectified spirit	m. 180

It is to be dropped into the ears three to four times a day after dry swabbing the ear with a dry, better sterile swab. Washing out of the discharging ear with hydrogen peroxide or any such antiseptic may be to the detriment of the patient and should not be done because the residual liquid left, even after careful cleansing, may make the parts sodden and lower local tissue resistance. Sulphadiazine orally or penicillin injections may be tried in serious cases, see page 26 etc. also.

Circulatory System. Minute and careful daily examination of the heart, pulse rate, etc. twice a day to exclude any oncoming endocarditis must never be overlooked. Daily examination of the heart and the urine needs also be done during the convalescence.

Complications. Some have already been mentioned, but endocarditis, chorea and other manifestations will be discussed under proper chapters.

Peritonsillar Abscess. The local signs and symptoms aggravate. The pain is more or less intense and may extend to the ear, mouth is opened with difficulty, swallowing is painful, the patient refuses to take any food; hence the combined toxaemia, want of food and weakness cause rapid emaciation.

The anterior pillars of the fauces are red or purple, swollen and the soft palate often shares the inflammation. Local bulging fluctuation and swelling of the uvula in many cases are also visible.

The *treatment* is in incision by a sharp pointed curved bistoury at the point of maximum bulging and fluctuation. Only the point being left out, the rest of the bistoury is covered by a sterile linear piece of linen. The incision is to be given nearly vertically from above[2] downwards to avoid injury of the important blood vessels at the back. A preliminary local application of a ten percent cocaine hydrochloride or pantocain solution, may make the operation less painful.

Often the patient retracts his head back due to pain and thus baffles an incision, therefore is the need of firmly supporing the head to prevent this retraction.

When the pus is very offensive washing the cavity with one in five thousand phenol may be useful. Some workers have advised immediate enucleation of the tonsil in cases of quinsy.[3] Sulphadiazine and penicillin may also be tried.

Convalescence. Very often both the doctor and the patient try to hasten the period of convalescence. Even an apparently trifling attack may cause intense prostration which should receive adequate dose of iron, arsenic, strychnine or nuxvomica with vitamins A and D may be of good help to build up the patients strength. One can prescribe a tonic like the following.

2. Wallace, (1929). Brit. Med. Jour. p. 296.
3. Wharry, (1929). Ibid. p. 766.

Liquor strychnine hydrochlor	m.	2
Liq arsenic hydrochlor	m.	3
Ferrous Sulphate	gr.	2
Adexolin	m.	15
Pulv Acacia	q.	s.
Syrup Rose	m.	60
Water upto.	fl. oz.	½

one dose twice daily after some food, for five days in the week, for three weeks.

Codliver oil or any such suitable fattening vitaminous tonic, with adequate square diet, goes a good deal to ward off future attacks.

CHRONIC TONSILLITIS

Diagnosis. There may be chronically enlarged tonsils without giving rise to much discomfort. Generally due to associated adenoid being enlarged the patient's facies is typical and these children are habitual mouth breathers, with a proneness to catch cold easily. Catarrh of the nasopharynx and the respiratory passages may be a matter of constant trouble to them. They usually have an improperly developed flat chest with mouth breathing, dry irritative cough, restlessness at night and disturbed sleep. Repeated acute inflammations of tonsils may help to give rise to such, serious systemic diseases, as rheumatic fever, chorea, endocarditis, nephritis, cervical adenitis, otitis-media etc. These chlidren are often backward in the class and are not uncommonly dull. They may suffer from deficiencies of the endocrine glands also. Chronicity should lessen under modern sulphathiazole, penicillin, prothricin etc. therapy.

TREATMENT

Septic tonsils with infection buried deep in their crypts, are usually not materially affected by any local application, of which probably Mandl's pigment is one of the best.

Silver nitrate solution ten to twenty percent may be applied. This should not be given more frequently than once a day or on alternate days.

Autovaccine. Auto-vaccine made from strepto-haemolyticus isolated from the patient's throat, beginning from fifty to hundred million organism increasing each time by the same amount, or more, given every fourth to fifth day, may do some good.

Improve general health. Improvement of the general health of the patient, by all means at our command, should also be insisted upon, and good food with all vitamins, butter, eggs, milk, tonics, open air life and breathing exercise may be of service.

Operation. But most of the chronically infected tonsils are prolific sources of toxic absorption leading to various systemic manifestations.

Dohlman (1934)[1] reviewing the indications for tonsillectomy has suggested that tonsils whose repeated infections are reasonably associated with systemic manifestations or cause other associated troubles directly or indirectly attributable to tonsillar[2] infection should be removed. Indiscriminate removal of all tonsils when only hypertrophied is not justified. Some are of opinion that as all lymphoid tissues of the body tend to undergo retrogression at the age of thirteen or there about, after puberty, their removal should be deferred till the patient reaches beyond that age.

But in short the following are some of the commoner indications for tonsillectomy.

(1) When they are the seat of chronic infection. (2) Repeated attacks of acute tonsillitis proving refractory to all medical treatment. (3) Repeated infection of the upper air passages. (4) When such complications like rheumatic[3] fever, endocarditis or nephritis, are apprehended or mild attacks of the aforesaid diseases have manifested themselves. (5) When there is cervical adenitis traceable to probable tonsillar infection.

CHAPTER XXXII

ACUTE BRONCHITIS AND TRACHITIS

Diagnosis. Though often considered to be a minor malady, common in both the extremes of life bronchitis may involve serious risks. It may be a primary disease or

1. Acta, otolaryngol, (1934). 20 : p. 934.
2. Medical Annual, (1936). p. 472.
3. Kaiser, (1936). Jour. of Lab and clinical Med. St. Louis 21 : March 1936. p. 609.

may be secondary to influenza, measles, whooping cough, typhoid-fever, tuberculosis etc. When secondary, the symptoms are likely to be masked by those of the primary disease, and the diagnosis may be missed, to the detriment of the patient. But the appearance of cough and expectoration altered pulse respiration ratio, some increase in the excursion of the temperature, and the typical physical findings on auscultation namely, at the early stages, the presence of rhonchi of various types help to diagnose the condition. Later on, other signs and symptoms develop too. Persisting bronchitis in young adults should arouse the suspician of tuberculosis of the lungs.[1]

When the finer bronchi of the respiratory tree are involved there may be very pronounced and grave signs and symptoms, like cyanosis, hurried breathing and so on, which require almost the same care as in pneumonia, hence they are not considered separately here.

Such conditions must be distingushed from pulmonary tuberculosis and similar diseases which are more adequately dealt with in the chapter on chronic bronchitis and emphysema.

TREATMENT

Prophylactic. Though the consenus of opinion is inclined to think that all these naso-respiratory catarrhs, specially of the upper respiratory tract, are caused by filter passers, yet there are secondary invaders which enhance the troubles.

Preventive and abortive measures taken in acute cold in the head, and also aerosol penicillin and streptomycin inhalation may be useful preventives, suphadiazine has a preventive action—see page 32 etc.

Specific—therapy as in pneumonia may be very effective cures. See for details—pages 27, 50, 52, 138, etc. For other causal organism streptomycin may be useful—see pages 62 etc. for details.

For the details of general management such as rest, room, ventilation, bowels, circulatory failure, insomnia, water balance, aches and pains the chapter on fever should be consulted. For oxygen inhalation see page 14 etc.

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1. Osler's Modern Medicine, Mcphedran, (1927). Vol. 4. p. 117. Lea and Febigers. Philadelphia.

Diet—diet should be mostly fluids and according to indication, appetite, desire etc. Fluids should be adequate, see also page 141 etc.

For cough– see pages, 143 etc. also page 180 onwards. When the *cough* is due to bronchitis and the *secretions are* dry –a prescription, with potassium iodide, ammonium chloride etc. discussed under chronic bronchitis may be given, thrice daily. If there is chronicity on which an acute exacerbation has taken place the treatment should be first for the acute flare up subsequently on the lines of chronic bronchitis and emphysema discussed later on. Rubbing the chest briskly with some strong liniment as on page 142 etc. may be useful. Inhalation of tincture benzoin compound in steam may be of some relief. But very effective may prove aerosol penicillin inhalation as detailed out on pages 53 etc. It may even cure this condition rather quickly.

Bronchitis of the finer tubes.
Acute suffocative catarrh.

Here again the signs and symptoms are of a very grave type and often the manifestations are like those of broncho-pneumonia. Cough with expectoration, cyanosis, dyspnoea, hurried breathing, marked asthenia may supervene quickly. These patients, commonly children, require stimulant line of treatment from the very onset, and also oxygen, tincture benzoin compound inhalation, should be started from the very beginning. Circulatory failure which often appears, sometimes from the start requires treatment in the lines suggested in pneumonia. Specifics like sulphadiazine and penicillin need be tried also.

Careful observation and record of the pulse rate, respiration, onset of cyanosis, dyspnoea, cough etc., should be made .

As already emphasised, stimulant line of treatment is indicated from the very beginning in these cases, specially with sulphadiazine orally or by injection when serious. Penicillin and streptomycin may have to be injected. For Sulphadiazine see page 27 etc. and for penicillin page 52, for streptomycin see page-62 etc.

CHAPTER XXXIII

PLEURISY

(Dry & with Effusion)

Dry Pleurisy.

Diagnosis. Friction rub, which remains constant after coughing, rather superficial, to and fro, with stitch at the side, aggravated by respiration, cough and so on, are suggestive. There may be pain on the sides but without pleuritic rub. The diagnosis of diaphragmatic pleurisy is often troublesome and always difficult. Primary dry pleurisy is usually tuberculous in origin. Previous good health, satisfactory general condition and mild symptoms are not generally to be regarded as sufficient evidence against this diagnosis. "Primary dry pleurisy, as indicative of tuberculosis, is equal in significance to primary pleurisy with serofibrinous effusion or haemoptysis only of a clear sky[1]". Pre-eruptive stage of herpes-zoster rarely may give rise to marked pain which may be difficult to diagnose, unless the eruptions come out. Skiagram of the chest, pulse, respiration, temperature, weight records may be helpful in diagnosis. Differentiation has to be made from intercostal neuralgia, pleurodynia[2] and other local causes of pain.

TREATMENT

Pain. The most important item in the treatment at the acue stage is the relief of the pain.

Fixation etc. Next to rest in bed, the first thing usually done, is to completely limit the movement of the affected side of the chest in *position of expiration by strapping* from the spine to the sternum with adhesive plaster of a suitable type. Before applying it, the hairs if present, should be shaved off and spirit and powder applied. The strapping should not be allowed to remain for more than seven days at a time. Care must be *taken not to abrade* the skin while they are removed.

Warmth locally. One of the simple methods to relieve pain is by local application of warmth or by counter irritation or better by both. One may choose any one or several of the following, cataplasma kaolini, (Antiphlogistine

1. Osler's Modern Medicine, Vol. 4. Lord, (1927). Diseases of the pleura: p. 226. Lea Febirgers Philad
2. Harder. (1936). Amer. Med. Sci. May: p. 678.

group), hot water bottles, linseed poultice, hot salt or sand bags, fomentation dry or moist, though the first method is preferred. Mustard plaster, brisk rub of either wintogeno or Vicks' vapo-rub etc., preceded and followed by fomentation, are of relief.

As the pain may keep the patient awake or prevent his rest one may give a powder like the following at bed time to promote sleep.

Luminal	gr.	1
Aspirin	,gr.	3
Phenacetin	gr.	2
Sodii Bicarb	upto gr.	10

one powder, every six hours.

When the patient is constipated one may add phenolphthalein or hydrarg subchloride half a grain in each of the above powders, till three are taken. If *insomnia* is present half a grain of luminal to each powder thus making a total of one and a half grains in all, for an adult, may be of service.

Dover's powder in five to ten grain doses is an usual remedy. For details see aches and pains in nasopharyngitis.

In very protracted cases about three to six leeches applied locally are of some use.

If the pain keeps the patient awake inspite of the above lines of treatment, morphine and atropine hypodermically in 1/3 and 1/150 of a gr. respectively or in similar doses may have to be tried. Heroin 1/12 gr. or omnopon 1/6 to 1/4 gr. eukodal one tablet orally or an ampoule given hypodermically relieve the pain of the patient. Another method of relieving pain is to infiltrate the parietal pleura, over the most painful area with about ten to twenty c.cm. of a one per cent solution of novocain. The same technic is followed as in cases of anaesthetising the pleura either during an artificial pneumothorax or exploratory puncture or paracentesis thoracis. A.P. may be the last resort when the pain is unbearable and baffles other treatments.

The more important item in the general treatment consists in giving the patient *absolute rest even* if he is afebrile and the general signs and symptoms do not warrant it. This complete rest period should extend at least upto two weeks in afebrile cases, but in cases with fever the patient should not be allowed to leave the bed at least for two to four weeks after complete subsidence of pyrexia. The sputum when present should be examined regularly for

acid-fast bacilli. A skiagram of the chest may divulge lesions which were missed by the clinical examination. Regular pulse, temperature and weight charts are of distinct use to keep watch on the case.

Preliminary evacuation of the bowels should be ensured as in all other acute febrile states.

Diet. At the beginning when there is not much inclination for food, only fruit juice, milk or its preparations, glucose etc., need be given. Later on maintenance of nourishment of the patient is of importance. For this the dieto-hygienic regime discussed under pulmonary tuberculosis should be advocated.

Convalescence. The patient should be very careful about his health for at least two years, because the risks of development of frank tuberculosis is great during that period[3].

The only guides to assess the progress of such cases are serial radiograms taken every few months, regular charts of oral temperature noted every four hourly, pulse and weight records and so on. The sputum should always be examined carefully, every few days, if not daily. We often see cases in practice who show recurrent pleuritis with fever but without any evidence of lung involvement. These cases are usually tuberculous in origin and as such should receive the same care and treatment as a subject of frank tuberculosis.

PLEURISY WITH EFFUSION.

Diagnosis. The most important diagnostic points are displacement of the apex beat, absence of vocal fremitus and complete dullness. Fullness of the intercostal spaces, imparied mobility, resistance on palpation are not exclusively found in this condition alone, but when associated with the first group of signs and symptoms, are diagnostic This abnormality has got to be differentiated from fibroid disease of the lung, massive pneumonia, malignant growths, aneurysm, massive collapse of the lung, pericardial effusion and others. Exploratory puncture where the signs and symptoms suggest may clinch the diagnosis. Skiagram of the chest is of definite use for this purpose.

Exploratory Puncture. The best site for puncture is either the fifth intercestal space in the anterior axillary or

3. Jour. Amer. Med. Assoc., (1933) 4th March p. 304.

sixth space in the mid axillary or seventh space in the posterior axillary or in scapular line in the space just below the scapula. It is a mistake to go too low for this exploratory puncture.

In a two or better five c.cm. syringe, with a fine but long hypodermic needle, are taken two to four c.cm. of a two per cent sterile solution of novocaine. The skin having been sterilised by tincture of iodine, the needle is inserted horizontally just beneath the epidermis and a bleb of novocaine made. Then the needle is pushed down more or less vertically and the infiltration of the tissues goes on by gently pushing down the piston and spirting out the local anaesthetic as the needle passes forward. Care is taken to insert the needle just above the upper margin of next rib, because if allowed to graze the inferior border of the upper rib in an inter-space, there is risk of injury to the intercostal vessels and nerves which lie in the groove at the inferior border of the rib. The tissues are thus thoroughly infiltrated by millimeters till the lessened resistence met by the needle shows that the parietal pleura has been punctured. Now once the needle is in the pleural cavity withdrawal of the piston will show the presence and nature of the fluid which flows in. The syringe should be fitted to the needle quite air tight and the latter be not pushed to the root, because it is at the root of a needle, where it gives way most easily. If no fluid comes and empyema is suspected a needle of stout bore should be employed. Once fluid is found in the pleural cavity, it may be drained by one of the following methods.

TREATMENT

Siphonage. The apparatus consists of a big bottle quarter filled with some suitable antiseptic, say one in hundred carbolic or one in thousand hydrarg perchloride solution. A rubber tubing having a wide bore needle fitted at the end, is also filled up with the solution. The bottle should be placed either on a chair or on the floor, but invariably at a lower level than the point to be aspirated. The needle properly sterilised attached to the distant end of the rubber tubing is inserted into the chest wall already novocainised. The other open end of the tubing is dipped under the fluid in the bottle. Now if the patient coughs vigorously or moderately, a little of the fluid from the already completely filled up tube flows down in the bottle kept at a lower level, establishing a siphon action and thus automatically the

fluid in the chest flows down and the required amount may be allowed to come out. There is another method of siphonage in which instead of using a bottle quarter filled, one uses a bowl or a pan slightly filled with water and the same principles operate as described above. The fluid may easily be aspirated by Potain's aspirator or any other suitable device.

Workers in the line differ in their opinion regarding the amount of fluid to be withdrawn. Scott Pinchin (1934)[4] is of opinion that one should wait for a few weeks, then should only withdraw part of it, unless the symptoms are very urgent. Whereas in Osler's (1934)[5] book, complete and successive withdrawl of fluid is advocated.

Hence the fluid should not be withdrawn without due consideration, and preferably when the conservative lines of management have failed to reduce it.[6]

Replacement of Fluid by Air or Oxygen is not much in vogue now. This according to Gravesen (1935) reduces the risk of subsequent tuberculosis of the lung.

An artificial pneumothorax apparatus is used for the air replacement of the fluid.

The method.

The artifical pneumothorax needle should be inserted about one to two spaces above the aspirating needle, and that after aspiration has started for some time, thus ensuring that no fluid can run up the tubing of the A.P. needle. Manometer reading should always control the process. Where oxygen replacement is intended, the air bottle is previously filled with this gas.

Another simple method of automatic air replacement. No pneumothorax apparatus is required and this process can be easily utilised in village practice with advantage. A hypodermic needle is inserted, either in the novaçainised second or third intercostal space in the mid-clavicular line and covered with sterile gauze. Air is automatically drawn into the pleural cavity as the fluid is aspirated by any of the means discussed above. This is an effective method and

4. Modern treatment in general practice Edited by Wakely, (1934). Pleural effusion. p. 134. Medical press and Circular publication.
5. Principles and practice of Medicine, Osler. (Edited by McCrae) 1935. p. 662.
6. Maurer, (1936). Brit Med. Jour., ii: p. 935.

is one of the simplest. Generally in such cases withdrawal of one to three pints of fluid usually suffices. As is generally encountered, so also in these cases, withdrawal of even one pint or less, not infrequently, brings the temperature down to normal and the remaining of the fluid gets rapidly absorbed. The appertures made by the needle should be sealed by collodion or tincture benzoin compound and a pressure dressing applied. A dcse of some stimulant medicine, or tea or coffee may have to be exhibited to the patient at the conclusion of the operation. Morphine and atropine may have to be given in cases of resulting or subsequent pain. It is always safe to give an injection of morphine and atropine before paracentesis is started notably in nervous subjects.

Other Methods. Though dealing with an exudate not likely to be absorbed very easily by diuretics, diaphoretics and purgatives, yet we are tempted to take resort to them for the first few days.

Conservative treatment should only be adhered to, for a reasonable period, because it is not to be followed when the patient's general condition deteriorates even after proper management. Intravenous injection of iodine solution and calcium gluconate, alternating with each other, twice a week each, has apparently helped in the absorption of fluid. Six to eight injections of each are often adequate. Recently most of our cases did well under this and other measures of therapy.

Injection of the pleural fluid. Some workers favour the subcutaneous injection of about 2 to 5 c.cm. of the pleural fluid, provided it is free from tubercle bacilli, once every third or fourth day. This is sometimes of use. I have found it also useful in some cases.

Medicinal treatment.

A prescription like the following one, may be of some use.

Calcium Iodide	gr.	5
Sodium Salicylate	gr.	5
Sodium bicarbonate	gr.	10
Diuretin	gr.	5
Thiocol	gr.	3
Syrup ferri Iodide	m.	60
Chloroform water	upto fl. oz.	1

one dose thrice daily, during the sub-acute stage, with or without effusion.

After Care and convalescence. Aftercare in all cases of pleurisy is as important as its immediate management. The underlying basis of 66.3 per cent of idiopathic pleurisy with effusion was, in a big series found to be tuberculous in origin, as diagnosed by skiagram and other modern methods, specially by follow up results.

At least two years should be the period following an attack of pleurisy, that one should warn the patients and their guardians to be careful about. Because it is in this period, that unless great care is taken, they turn to be frank tuberculous subjects.

For this, prolonged convalescence[7] with rest, fresh air, abundance of good nutritious food, codliver oil, butter, milk, eggs, are helpful in getting over the effects of pleurisy easily and to build a good resistance. When, the temperature weight and pulse charts and serial radiograms prove suspicious, the question of sending the patient to a suitable sanatorium should be seriously considered. High altitudes with a bracing dry climate is usually better than a sea voyage. Such patients of pleurisy generally develop adhesion between the layers of the pleura, making treatment by collapse therapy impossible[8]. Here other surgical lines of treatment may have to be considered, specially when the patient does not improve under conservative lines of management. For the details the chapter on pulmonary tuberculosis should be consulted.

CHAPTER XXXIV
EMPYEMA

Generally in the great majority of cases empyema develops after pneumonia or bronchopneumonia, (metapneumonic) but it may be secondary to septicaemia or pneumonia called syn-pneumonic empyema or may develop by contiguity from any wound or sepsis in the thorax[1] or abdomen. Lymphatic, or venous drainage may help in the spread. The incriminating organisms are usually pneumococcus, streptococcus and other organisms.

7. Trail, (1935). Brit. Jour. Tuberc. 29: p. 175.
8. Marshall, (1936). Brit. Med. Jour. ii, p. 936.
1. Collis, Davison and Smith (1945 June. 23) Lancet. I. p. 778-781.

There should always be some suspicion when after the crisis of pneumonia, the convalescence as expected, is not so uneventful, the pulse rate rises, there are pain and cough, the temperature goes higher, and a leukocytosis and other signs and symptoms of sepsis in the body such as perspiration, anaemia, pallor etc. are apparent and also the physical examination reveals accumulation of fluid in the chest.

But there is another variety developing after capillary bronchitis, which is rather difficult to diagnose, but these infections usually streptococcal in origin, may evade diagnosis unless any exacerbation of the signs and symptoms are carefully evaluated and a thorough physical examination, a leukocytic count done and a skiagram of the chest taken. In the pneumococcal cases the underlying lung is as a rule better and has recovered some functional activity, whereas in the other type the pleural infection is generally coincident with a pneumonic change in the lungs.

Diagnosis. The diagnosis should be confirmed by anaesthetising the part and aspiration of pus, culture and typing of the organism. Next, where possible, a skiagram of the chest should ascertain the details.

TREATMENT

Sulphadiazine should be tried specially in cases of streptococcal origin. But recently daily aspiration of pus and local instillation of 40 to 50 thousand units of penicillin[2] intrapleurally and that kept up for a week or sometime longer till the patient is cured has practically done-away with surgical help with open drainage. See pages 51, 52 etc. specially 54 for details.

Some of the indications of aspiration in prepenicillin days were. (1) When the patient was too ill to stand thoracotomy. (2) When the pus was thin but not purulent (3) Usually in streptococcal infection (4) If the underlying lung is found to be the site of mischief (5) Skiagram showing diffused infection with empyemata. When *associated with* septicaemia or pneumonia proper systemic sulphadiazine coupled with penicillin therapy[3] should have to be instituted. If the patient is too week and anaemic a compatible blood transfusion may tide the patient over the critical period. For the details see pages 51, 52 etc.

2. Blades, Hamilton, Dugan (1945 April.) Surgery. 17. p. 572-589.
3. d'Abreu et al (1944) Brit. Jour. Surg. 32: p. 179

Convalescence—should be prolonged, and sufficient, vitamin rich diet, codliver oil, milk, eggs, leafy vegetables, butter, fruits given besides other articles of diet. If the original infection was long and protracted a change to a more bracing climate might help quick recovery. Deep breathing[4] exercise, forced blowing through a Woulfes bottle may help the expansion of the lung once collapsed.

CHAPTER XXXV

LEPROSY

DIAGNOSIS :—The recently desribed types are[1].

1. NEURAL OR NEUROMACULAR.

A. *Macular*—There appears on the skin one or more patches clearly defined round, oval or irregular in shape in which one or more of the following changes are noted. (i) Loss of pigment (ii) Diminished cutaneous sensibility (ii) Thickening of the cutaneous nerve to that area (iv) Thickening and erythema notably of the margins rarely going on to ulceration (v) Dryness due to impairment of sweat function, scaliness, failure of growth of hair if present hairs usually are depigmented.

Macules may be subclassified—(a) minor tuberculoid type—shows simple whitish areas, neither elevated nor thickened nor erythematous. Nerves in the area may not be involved. (b) *Tuberculoid type*, shows marginal thickening, erythema, neural thickening with anaesthesia. (c) Tuberculoid major—the whole patch is thickened and not limited to the margins only with other changes as found in b group.

B. *Anaesthetic type*—is characterised by (i) impairment of cutaneous sensibility, (ii) anhydrosis, (iii) paraesis or paralysis of the muscles supplied by the affected nerves resulting in contracture and deformity (iv) trophic lesions like decalcification of bones of hand and foot, trophic sores, ulcers, mutilations with secondary infections etc. The commonest involved nerves are *ulnar, peroneal and post tibial etc.*

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4. Bohrer (1934 July) Ann. Surg. 100. p. 113.
1. Low (1943) Principles and Practice of Tropical medicine by Napier p. 481. Thacker Spink Co.

II. LEPROMATOUS TYPE—In India this type of disease usually shows the following changes.

(i) Slight diffuse thickening, sometimes with erythema with soft velvety feel. (ii) Macules on the skin with pigmentary changes no clear cut margin as in neuromacular type, smoother surface without anaesthesia, no thickening of nerve, velvety feel, plenty of bacilli in the tissues by biopsy. (iii) Noduleformation of various types. (iv) Ulceration of nodules.

Mucous lesions may be those of nose, pharynx, larynx, etc. with or without ulceration and disfigurement.

III. *Atypical or cases difficult to classify*—may be diagnosed by (i) Variable degree of cutaneous anaesthesia (ii) thickening of the nerve (iii) finding of the mycobacterium Leprae.

Differentiation has got to be made from[2] syphilitic lesions, lupus, Boeck's sarcoid, dermal Leishmanoid, psoriasis, sclerodermia, seborrhic dermatitis, leukoderma, syringomyelia etc.

TREATMENT

Prophylaxis :—children being very susceptible, should be removed from leprous parents and contacts. Nasal discharge should be carefully disinfected as they may contain plenty of the mycobacterium leprae. Careful habit of never eating and drinking from utensils suspected or actually to have been used by patients is essential. Open ulcers or mutilating active scars are dangerous as they discharge living bacilli. Domestic servants, helps, washermen should be carefully chosen. *Leprous colonies*, homes, asylums are useful to segregate the sufferers with the advantages of home and social life.

Specifics :—Prolonged use of streptomycin is expected to be of considerable use as in cases of pulmonary tuberculosis, for the details see pages 63, and 155 etc. Recently intravenous use of 2 to 5 g of promin[3,4] in 5 to 12.5 c.c. of promin solution daily for a period of many months has been favourably reported. For the details see pages 156

2. Correspondence (1946 Dec. 14) Jour. Am. Med. Ass. 132: p-9n47.
3. Cowdry, Ruangsiri (1941) Arch. Path. 32: p-632.
4. Wharton, (1946. Octo) Leprosy Review p. 96.

etc. under the treatment of pulmonary tuberculosis. Some workers have reported favourably on the prolonged use of diasone[5]. But the uses of both promin and diasone need always be controlled by the regular systematic examination of the blood, for their haemolytic and other effects, for the details again see pages 156 etc. under pulmonary tuberculosis. For the secondary lesions and ulcers penicillin has proved of good use[6]. But howfar these will be able to replace the older remedies of oil hydnocarpus wightiana group it is difficult to say yet, time only will assess it. Combined treatment by promin group with penicillin has proved of use in lesions of the mucous membranes etc.

General measures.

The mycobacterium leprae are not very highly pathogenic. It is only on a system of much lowered resistance, through various causes, that the disease gets grafted. Hence in the treatment no effort should be spared in finding out other intercurrent diseases or causes which undermine the health, and such as malaria, syphilis, intestinal worms, gastro-intestinal or deficiency diseases, sedentary occupation, unhygienic habits, lack of physical exercise and so on, responsible for lowering the general resistance of the patient, will have not only to be corrected, but also proper steps taken to raise the systemic resistance of the patient by all means.

Drug therapy Besides the specific antibiotics and sulphones mentioned already various preparations of oil of hydnocarpus wightiana are in general use. An ethyl ester of hydnocarpus is sold under the name of "Hydnestryle" by Messrs Smith Stanistreet of Calcutta. This may be injected intradermally round the patches in one to two minim or more doses in several places just covering the outermost margin of anaesthesia; where such injections do not cause reaction in the form of local swelling, increased pain along the nerves, and greater swelling or redness of the patches, even slight fever, aches and pains, one is justified in giving injections of ½ to 1 or 2 c.c. doses in the gluteus muscle to evoke a mild reaction in the form stated above.

5. Muir (1946. Octo.) Ibid. p. 87.
5. Leprosy Review (1945 Aug.) 16. p. 4.
6. Muir (1936) Lancet, ii, p. 391 and 448.

During the period of reaction the patient should be in bed for a day or two, take a mild purgative. During this time 1 to 4 c.c. of potassium antimony tatrate in 2 per cent solution may be given per vein. All the septic foci should be eradicated. These injections intradermal first subsequently coupled with intramuscular ones in the buttocks should be continued for months, minimum for a course is usually three to six months. When these injections evoke much reaction local, focal and general, the dose may have to be reduced atleast, it should never be increased, rest etc. ensured and the interval increased to once a week instead of twice a week or every 5th or 6th day. When there is not much of a reaction *potassium iodide in one to two grain* doses once or twice daily for one to two doses in all may evoke a reaction which may be mild to severe, in the latter case the dose of iodide should not be repeated before complete subsidence of the reaction. In some of my cases even 5 c.c. of the ethylester has not evoked a reaction when given in the gluteus. Naturally the reaction will vary according to the resistance, state of immunity, duration, nature, severity of the disease and other factors. I have used this ethyl ester on a fair number of cases with almost uniform arrest of the disease. *Freshly prepared oil of hydnocarpus wightiana* may be used exactly in the same way as the ethyl-ester.

Moogrol (B.W. & Co.) is a mixture of ester of the acid of the Chaulmoogric series for intramuscular injection in 1 to 2 c.c. doses initially to be increased according to reaction. Iodised by the addition of 0.5 per cent iodine appear to make it less irritating. *Alepol* (B.W. & Co.) or sodii hydnocarpus is mixture of sodium salts derived from the less irritating low melting fractions of acids of hydnocarpus oil. It is given intramuscularly first, intravenously twice a week if the intramuscular injections do not cause reaction. If an equal quantity of blood is drawn in the syringe and mixed up before injection the reaction is lesser. But for safety before giving Alepol intraveneously it is better to try 1 to 2 c.c. intramuscularly initially, and then proceed with caution according to the reaction to intravenous route.

One of the best guides, besides the reactions local focal and general is the *rate of sedimentation of the erythrocytes*. The details of this sedimentation are almost as significant as in pulmonary tuberculosis. A quick rate meaning active disease.

Protein Shock—has been found useful in some cases specially when combined with hydnocarpus preparation. *T. A. B. vaccine* may be given in 5 to 10 million doses intravenously twice a week till reactions are evoked. Later on with the development of agglutinins in the system the reactions may not be much. *Milk protein* may be given intramuscularly in the gluteus from 2 to 5 c.c. doses once or twice a week. Raw treated defatted tubercle bacilli with either petrol or ether and injected subcutacutaneously once a week till 10 such are given has advocates. *But all these should be so dosaged that they are just short of very severe reaction which may break down the resistance and the barrier around the lepromatous cells and tissues.*

Intranasal ionisation of the infected nasal mucosa -- may be tried. But how far useful will be a spray of strepmycin in these affections for faces it is not yet sure to say, but local insufflation of a fine powder of promin, and aerosol penicillin have been useful. But from the analogy of the favourable effect of streptomycin on almost all surgical tuberculous lesions, it is expected to be useful here too, specially when in combination with sulphones and penicillin.

Dyes—like 2 per cent Fluorescein solution in aqua distil or normal saline, or 4 per cent solution of "trypan blue" in 5 to 20 c.c. intraveneously once a week has been found useful. Personally I found fluorescein solution useful in a few cases.

Neuritis, besides other systemic treatments, he should receive all the B vitamins specially B^1 etc. Ephedrine in 2 gr. doses in hard capsules are said to be useful for the nerve pain.

Surgical measures etc. Amputation, correction of deformities by massage, passive exercise, extension, splinting, bandaging and so on, may be employed. Necrosis may be treated by ultra-violet rays, massage, diathermy and such like therapy.

In laryngeal affection, local insufflation of cocain or orthoform, is of use, and relieves pain. Specifics like streptomycin, promin, penicillin should be used also.

Diet etc. Diet should consist mostly of fresh fruits, milk, eggs, butter, vegetables etc. Not only all the proximate principles should be included in it but also care

should be bestowed to add all the vitamins liberally. Fish, meat should be taken as desired, but all stale or tin-foods should always be avoided. Fruits, milk, eggs, fresh vegetables may be of much use. Dilute hydrochloric acid and pepsin, in suitable doses after the two principal meals have been found useful by me.

Physical Exercise. Sufficient physical exercise in the open air, to the extent of getting free perspiration is of signal service for the cure of leprosy of all grades and types. It promotes health by assimilation of food. The skin gets more supply of blood which helps quick recovery of local lesions.

Prevention. To be away from the sources of infection, such as lepers[7] or suspected unclean persons constitutes the main item in prevention. Lepers should better be isolated in colonies. Begging in the streets, handling of foods, keeping of shops of clothes, toys, medicine etc. by lepers should be prevented. Servants, prostitutes, vendors of food, drinks etc., may prove to be good sources of spread of the infection. Children should be segregated early. Infected persons should be treated promptly. Something like an ideal leper-colony is probably the one at Philipine Islands near America.

CHAPTER XXXVI

CHOLERA

DIAGNOSIS—

Clinical Types of Cholera. Clinically there have been numerous classifications of the types of cholera. But the manifestations of the disease depend mainly upon the resultant of the two fighting forces, namely, the nature, dose, virulence of the vibriois and the resistance of the individual infected. This resistance may be local in the intestine, or systemic and general.

The clinical types usually described are:—

(1) Choleric diarrhoea. (2) Simple sporadic cholera. (3) Ambulatory cholera. (4) Malignant cholera. (5) Dry cholera or Cholera Sicca.

History of the case. In an average case of cholera the history is something like the following.

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7. Muir, (1934) Ind. Med. Gaz. 69: Sept. p-495.

The patient retires for the night in good health after partaking a suspicious or good meal. Late at night he is aroused from sleep by a slight discomfort in the abdomen round the umbilicius, thus indicating the site of mischief etc., to be in the lower part of the small intestines. He passes almost a normal motion, which is effortless. Then again another one in a few minutes time. Thus gradually the motions tend to be bileless and assume more or less a rice-water character. He develops weakness out of proportion to the number of motions. Vomits may follow or precede them. The vomited matter also tends gradually to be without any tinge of bile. The urine becomes gradually scantier till in bad cases it is totally suppressed. Generally griping, pain etc. are singularly absent in an average case of cholera. The weakness, out of proportion to the number of stools, is very suggestive. Then follow the burning sensation of the body, thirst, weakness, cramps etc.

Other points helping diagnosis are signs of dehydration, washer-woman fingers, eye-sockets hollower, with anxious look, prominent cheek bones. There is a characteristic shrivelled up appearance. Later on one finds cyanosis and cramps the patient may thus slowly pass into coma.

Gradually at the later stages, the patient may either come round in favourable cases, or may take a worse turn or some of the other serious complications may supervene.

Some important signs & symptoms.—

Vomiting. The first few vomits contain bile and semi or undigested food material, but gradually they assume rice-water character without traces of bile. Generally the vomits are also effortless like the stools.

Purging. Except the first few which may contain faecal matter and be coloured with biliary constituents, the motions gradually assume the typical rice-water character, though they too are effortless from the very beginning.

Cramps, may be agonising and are more marked in the muscles of the extremities and the abdomen.

Temperature. Though the axillary temperature falls several degrees below normal, yet the rectal temperature may be even as high as 104°F. The higher the rectal temperature the worse the prognosis, besides other factors.

Collapse. (1) May be due to loss of fluid and it manifests itself in form of intense dehydration as indicated above.

(2) Or the collapse may be due to cardio-vasomotor weakness. This is specially the case in the subsequent collapses.

The first few collapses are generally due to loss of fluid as indicated by the raised specific gravity of blood, from the normal figure of 1056, it may go even up to 1064 or more, indicating treatment by saline infusions. In children normal specific gravity of blood is near about 1058.[1]

But in the subsequent collapses the cardio-vasomotor weakness plays a correspondingly greater part. Here, inspite of severe collapses the specific gravity of blood is not materially raised.

Blood Pressure. Regular blood-pressure reading of the patient is also invaluable for scientific treatment of cholera. It is only by recording carefully the blood-pressure and specific gravity of blood that one can ascertain, whether the cause of collapse in a particular case lies in loss of fluid and consequent dehydration or is due to cardio-vasomotor weakness as indicated by an abnormally low blood pressure but with a more or less normal specific gravity.

Scanty or suppressed urinary secretion.

There may be scanty urine or complete anuria with uraemia.

The signs and symptoms are coated dry tongue, suppression of urine, irritability or undue calmness of temper with red congested eyes, or apathy, even coma may close the picture. The respiration may be increased in depth and frequency and the patient may show convulsion with a tendency to be boisterous.

Probable causes which conduce to uraemia are.

(1) *Raised specific gravity of blood.*

(2) *Raised nonprotein nitrogen content of blood.* "The nonprotein nitrogen content of blood in 66 cases of cholera has been investigated by D. R. Dhar and P. C. Adhyee, who found a high reading to be associated with fatal post choleric uraemia, but a low content to be of good prognostic significance. The importance of early treatment to prevent renal stasis is emphasised.[2]"

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1. Banerjee, (1931). Handbook of Cholera. p. 102.
2. Med. Annual, (1932). Cholera. p. 102.

(3) *Toxic action on the Kidneys.*
(4) *Delay in starting treatment.*
(5) *Too low blood pressure.*
(6) *Loss of alkali reserve and acidosis.*
(7) *Prolonged Collapse.*

So Clinically—

(1) History; seasonal prevalence; cases in the neighbourhood or in the family; history of exposure; the more or less typical signs and symptoms, of special importance amongst them being the dehydrated appearance; weakness out of proportion to the number of the stools, burning sensation, thirst, cramps etc. Bile-less or rice-water character of the stool and vomits, anuria etc.

(2) The following *laboratory methods amongst others are also useful diagnostically* :—

All bacteriological examinations aim at detection of the vibrios in the stool. Cholera red reaction; agglutination test, relative and absolute increase of red and white blood cells, specially large mononuclear variety of the latter. Raised specific gravity of blood etc.

TREATMENT

Prophylaxis. Inoculation of cholera vaccine confers short lasting protection. Kasauli type of vaccine in India, 8000 million organism per c.cm., first dose half a c.cm., and seven to ten days later one c.cm. for an adult are suitable. Protection usually is effective for six months.[3] Bilivaccin can be taken orally, but it is not so sure, as the absorbability of persons vary, hence there may be some uncertainty in effect.

House, premises, and the vicinity should be kept sanitary. Solids and liquids should be boiled before taking. No raw things, specially if of unknown or suspicious sources should be taken. Ensure protection against flies and their contamination.

For the doctor, besides the above, he should be careful in handling cases. Hands and nails should be kept clean, empty stomach may conduce to infection. Even slight diarrhoea should receive prompt attention.

3. Wardener (1946 May. 4) Lancet i. p. 637.

As a *prophylactic* in cholera and for the treatment of summer diarrhoea, a prescription like the following is often effective.

Acid sulphuric dil	m.	6
Acid hydrochloric dil	m.	10
Glycerine	m.	5
Water	upto. fl. oz.	one

one dose twice or thice daily after meals

Howfar sulphaguanidine will have prophylactic value besides vaccine injection it is not yet possible to say.

CURATIVE.

Treatment of Cholera. The principles involved in the treatment are—

(1) To kill the organisms and to neutralise or destroy their toxins.

(2) To treat the symptoms and complications as they arise.

DRUGS WHICH ACT BY DESTROYING TOXIN AND KILLING THE VIBRIOS.

Specifics and Recent Treatment.

In a controlled series of cases of cholera treated in Calcutta[4] under the care of American Army medical authorities showed that *sulphaguanidine or sulphadiazine in two to three g doses every four hourly* along with intramuscular injection of *penicillin* one lakh units initially and 20 thousand units every 4 hourly till three lakh units in all, along with intravenous saline injections *coupled with plasma* transfusion in severe cases gave practically no mortality in 78 serious cases, whereas under conservative therapy the mortality rate was in serious cases nearly 95.8 per cent and 15.8 per cent in chemotherapy alone[5].

Reimann[6] treated cases of cholera by intravenous warm saline upto 1 to 2 liters with 300 c.c. of 2 per cent sodium bicarbonate solution and sips of 50 c.c. of one percent soda-bicarb solution during the acute stage, and having allowed tea and drinks during the acute stage got a mortality rate

4. Editorial (1946. March 23) Jour. Am. Med. Ass. 130: p. 790.
5. Epidemiology, unit. No. 50. U.S. Nav. M. Bull. (1945. Dec) 45: p. 1049.
6. Reimann, Change et al. (1946 Sept.) Am. J. Trop. Med. 26. p. 631.

of about 5 per cent. He did not find chemotherapy and streptomycin of much value. But Lahiri[7] gave 2 g doses of sulphaguanidine 2 hourly subsequently four hourly in cholera with encouraging results. Huang[8] treated by three g initially and one g 2 hourly with one fatality in 22 cases of cholera. See also page 31.

Practical Difficulty of the patient is to retain the sulphaguanidine due to nausea and vomiting. An antiemetic powder coupled with sulphaguanidine in 4 g dose initially followed by 2 g 2 hourly for first 3-4 doses subsequently 4 hourly coupled with saline alkalies and glucose per vein and also plasma for retention of the salines longer and to supply colloids to the blood in serious cases is certainly a very promising line of therapy. But the difficulty of getting 200 to 500 c.c. of plasma in out of the way places is certainly great. Penicillin though is given appears not so useful as in other coccic infections probably due to the fact that the mischief of cholera is so quick that very little is generally left for penicillin to accomplish. But we must wait for further work, in the mean time take up chemotherapy, plasma, saline and glucose alkalies per vein as the therapy of choice. Recently Lyovac normal human plasma introduced in the market by Messrs Sharp and Dohme in 50, 250, and 500 c.c. packings has made administration of human plasma in serious cholera cases within the reach of most practitioners. This is a dry plasma to be dissolved in solvent supplied just before introduction in-to the patient.

Potassium Permanganate. Rogers[9] (1915) used due to its oxydising properties. It is generally given in salol or keratin coated pill or with kaolin. They should be fresh, otherwise pass out of the intestines undissolved, act by oxydising the toxins and by destroying the vibrios. But sulphaguanidine appears better and more rational see-p 31 for details.

Kaolin. Kuhne[10] (1918) was one of those who introduced it in the treatment of cholera. It acts by adsorbing[11] toxins[12] and preventing their absorption in the system. The

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7. Lahiri (1944) Jour. National. Med. Inst. Cal. July. p. 28.
8. Huang (1944) Jour. Am. Med. Ass. 125.
9. Rogers (1915) The Lancet. ii, p. 219.
10. Kuhne, (1918). Romande Generama. 38: p. 555
11. Dhar & Sen, (1928). Cal. Med. Journal. August.
12. Dhar, (1930). Cal. Med.. Journal. November.

vibrios also get mechanically entangled in the mass and thus kaolin acts beneficially.

Hydrarg-subchloride (*Calomel*)—

When there are *nausea and vomiting*, a prescription like the following may be of service, and is usually given as a routine method nowadays.

Hydrarg Subchloride	gr.	1/8
Camphor	gr.	1/8
Menthol	gr.	1/8
Chloretone	gr.	1
Soda Bicarb	upto. gr.	4

One powder, every half an hour, from the very beginning of cholera.

Eight to sixteen of the above powders may be given in the majority of adult cases and fewer for younger patients, at first, every fifteen minutes to half an hour, later, every two hours or at longer intervals.

In this powder menthol and camphor in too small a dosage to influence the heart, are likely to be of use in tympanites. Chloretone is of service in nausea and vomiting. Where these symptoms are lacking, simple hydrarg-subchlor powder without menthol and chloretone may be given.

Though of some use in a case of mild cholera, specially at its earlier stages, this powder appears to have no appreciable use unless associated with saline injections, once the patient is in a stage of collapse.

TREATMENT OF SYMPTOMS AND COMPLICATIONS.

Alkaline Mixture. For details see page 75.

Collapse.

Collapse should be treated according to the cause.

When the collapse is due to *loss of fluid*, as shown to a great extent, by the raised specific gravity of blood and other clinical findings of dehydration, saline transfusion is of service. Besides taking of specific gravity of the blood, determination of the relative amounts of fluid and cellular constituent of a cholera-patient's blood by haematocrite, may afford additional and even useful data and thus form an important guide in the treatment.

Modes of giving Saline.

Orally. When so administered, is seldom retained due to the constant vomits. Even when saline can be retained and if taken in sips orally, it is as a rule not sufficient for the purpose of combating collapse.

Rectal. Though saline can not be given per rectum when the stools are frequent, *at later stages it should always be given as a routine,* specially when the stools have become less frequent. For this purpose four ounces of normal alkaline or plain normal saline, with or without glucose, are of use in all cases of cholera.

Composition of commonly used rectal saline :—

Sodium Chloride	gr. 80
Sodium Bicarbonate	gr. 60
Glucose	oz. 1
Distilled water	upto. pint one

Four ounces, high up rectally, by Murphy's drip method, every two to four hours, according to indication. In children about two ounces at a time, at the same interval.

Intravenous. Transfusions of saline given by this route is the quickest and the most effective means of combating collapse due to loss of fluid.

Salines may be given by the closed method. It means without cutting open the vein. This is the ideal way of giving intravenous saline and is only possible in cases where the collapse is not profound. The great disadvantage of allowing the patient to pass into a collapse, is in the failure of the kidneys to work for want of an optimum pressure of blood and due to excessive loss of fluid etc. Before these valuable, delicate excretory organs are much damaged by collapse, dehydration and other factors, saline transfusions should be administered. Given before profound collapse sets in, they are actually found in practice to be of greater service to the patient than salines given at the later stages under profound collapse. Smaller amounts of saline in cases without collapse will do a greater good than larger amounts given at the later collapsed stages.

Not only this, the *risk of sepsis* of a wound in a system with lowered resistance due to cholera is also not inconsiderable and it is probable in cases where salines are given by opening up a vein.

Open method. But in cases where the collapse is pronounced, as generally is the case when doctors are called, it may not be possible to give saline by the closed method.

In such cases saline is given generally by cutting open one of the big veins at the elbow, rendered prominent by tying a rubber tubing above, and with all sterile precautions, the skin over the most prominent vein is cut open and dissected out. With ordinary forceps the vein is held up and it is ligatured by silk below and distally. About half an inch or just a little above this point ligated, one makes a slit-like apperture obliquely cutting open half of the circumference of the vein and a suitable canula inserted. The canula thus introduced can be fixed by another loop of the silk without completing the knot, this prevents the canula from slipping out. The wound should be covered by a piece of sterile gauze and the arm should not be allowed to be moved, as this will help the canula to come out and spoil the whole process, necessitating the trouble of its reintroduction.

Practical facts. Though the open method is admittedly more risky than the closed method, yet in the vast majority of cases, when the doctors are called in, the patient generally is in the stage of collapse, leaving no other alternative than to take recourse to the open method. If the case is judiciously managed, one can give repeated injections in the same once opened-up vein. Practically one has given saline thrice at a few hours interval in the same case by only opening up the vein once. But such happy results are not always possible.

After the transfusion is over the parts should be touched with tincture iodine and the vein ligatured. The skin should be stitched up touched with iodine and properly bandaged, and due aseptic care taken, as there is always a risk of sepsis and even cellulitis developing. This holds good in all injections in these patients of lowered resistance.

How much saline is to be given? Generally the raised specific gravity of blood, indicating loss of its fluid constituent, is a workable guide, as to the amount of intravenous saline to be given in a particular case.

When the specific gravity of blood is near about 1064, generally for an adult, about three pints or less intravenously and about one pint subcutaneously is adequate and actually proves effective. When the specific gravity is near 1062, three pints or two and a half pints given slowly or two pints per vein and one pint subcutaneously will generally prove sufficient. For 1060 specific gravity of

blood, about two pints may prove adequate. For 1058, one pint per vein or in the absence of urgent signs and symptoms only one pint subcutaneously may prove enough. Subcutaneous salines though not very rapidly absorbed are more lasting in effect.

In the human system, as in other forms of treatment, there cannot be any fixed formula, so every individual case of cholera need be treated on its own merits and indications etc. and that after due consideration to all the aspects of the case.

Generally it is now admitted by all workers that more than three pints of saline intravenously at a sitting, is injurious specially in view of the fact, that the patient's cardio-vasomotor apparatus has been used to a smaller volume of blood, and if on this system suddenly a large bulk of fluid burden is thrown, it may fail to work properly and the subsequent vasomotor weakness may be unduly enhanced.

Rate of flow of saline. Though generally four ounces per minute or a pint in five minutes is the usual rate of flow of saline advocated, yet to most observers this is too quick a rate, specially for the enfeebled system, and for the weakened cardio-vasomotor mechanism.

As the fluid of the system lost in cholera is rather gradual, so the ideal of treatment theoretically should aim at replenishing the fluid very gradually. For this purpose, the slower the inflow of saline the better is the result.

From clinical experience on actual cases one has found invariably, that large quantity of saline given quickly is less effective than comparatively smaller amounts given slowly. The quicker injections, even of the best hypertonic saline, almost always result in quick evacuation of bowels, followed by corresponding quick collapse. Slow intravenous salines always give better results, as compared with the quicker ones.

Temperature of the saline to be given. Before the saline injection is given the patient's rectal temperature should be taken. When it is near about 103° or 104°F. it is always unsafe to give intravenous saline. It is definitely indicated in such cases that the body temperature should be lowered down by either, ice-cap, cool sponging or cold-

packs or by iced rectal salines. After the rectal temperature has come down to about 100°F or there about, room temperature saline, that is, saline having a temperature of near about 80°F can profitably be given. When the rectal temperature of the patient is about 98° or 99°F the temperature of the saine should also be about the same, that is, about 98°F. If the collapse has been for a longer time and the patient's rectal temperature is 97°F the saline should have near about 100°F or a little higher temperature. As a matter of clinical experience on several hundreds of cases one has noticed hyperpyrexia or other unpleasant reactions following transfusion of saline, to be much less comparatively in lower temperature salines than in those having higher temperature, as was advocated by former workers.

When to stop. Always the patient should be watched very carefully. So long as he receives the saline comfortably or when he falls off to sleep, one should continue the transfusion. Once the pulse is full and up to the desired volume, tension and pressure, one may stop further inflow. Sometimes, rigor or other troubles may necessitate temporary cessation of the injection but they generally pass off, specially if occur at the beginning of treatment. This means either too rapid an inflow or higher temperature or some cardiovasomotor weakness or some other trouble. But there are some contra-indications of saline infusion. They are :—(1) Severe headache. (2) Precordial distress. (3) Cardiac embarrassment. (4) Severe rigor. (5) Marked restlessness. (6) Oedema lung.

The above group of troubles should be taken seriously and the rate of flow much reduced and the effects watched, if even after that the complaints persist the flow of saline should be stopped for the time being and the effects noted.

When to repeat salines. Transfusions may be repeated any number of times, according to indication, specially when the collapse is due to loss of fluid, as directed by the raised specific gravity of the blood. In severe cases *plasma upto* 500 c.c. may be given in saline for maintenance of colloid balance with lasting effect.

But one should carefully bear in mind the fact that during the later collapse, *i.e.*, from the third or fourth or subsequent collapses, the cardio-vasomotor weakness plays a proportionately prominent and relatively greater role, as is shown by the fact that specific gravity of the blood remaining near about normal the patient passes into a collapse.

This indicates some cardio-vasomotor weakness and intravenous saline transfusions specially of a bulky nature may in this subjects, even help in causing rapid death. Under such circumstances cardiac and vasomotor stimulants are as a rule indicated.

WHAT SHOULD BE THE STRENGTH AND QUALITY OF SALINE?

The various types of salines are :—Normal saline, containing ninety grains of sodium chloride to a pint of freshly prepared distilled water. Hypertonic saline should contain one hundred and twenty grains, hypotonic sixty grains of sodium chloride to a pint of fresh redistilled water.

Alkaline saline may contain hypotonic saline one pint with about one hundred and twenty to one hundred and eighty grains of sodium bicarbonate per pint. Normal or hypertonic saline with above mentioned amounts of sodium bicarbonate to each pint may also be used in suitable cases. To any one of these salines one may add the desired amount of sterile glucose solution required for that particular case. The original hypertonic saline of Rogers consisted of sodium chloride one hundred and twenty grains, calcium chloride four grains, potassium chloride six grains, sterile distilled water one pint. But now-a-days the potassium chloride is generally omitted. Calcium can be given separately in the form of gluconate, and so on.

The above solutions should all be properly sterilised before transfusion.

Hypertonic saline was justly advocated by Rogers in cholera, because with the fluid stool much of the sodium-chloride also is bound to be lost. In order to retain fluids in the system, unless enough sodium chloride was made to be retained in the tissues, the dehydration could not have been combated. Human plasma would be useful in repeated collapse.

Personally one has used *one per cent saline* in bad cases, specially for the earlier repeated collapse with gratifying results.

Salt solutions given per vein also tends to lower the invariably raised non-protein nitrogen content of blood, in cases of cholera.

Reduction of alkali reserve in cholera[6]. Sellards and and his coworkers[13] (1911) showed that there was consider-

13. Phili: Jour. of Sc. Sect. B. Med. Sci., (1911) 6. p-53

able diminution in the alkali reserve of the system, in cases of cholera specially at its later stages. This work was also substantiated by the investigation of Rogers and Shorten[14] (1915) in, the then cholera wards of the Calcutta Medical College hospitals.

Alkaline saline. For clinical purposes, one has found better results when transfusion of alkaline saline with glucose is started early than otherwise. This is all the more indicated where there is scanty urine or anuria.[15]

Alkaline saline with glucose. When uraemia is threatening saline containing glucose, six drachms, sodium chloride two drachms, sodium bicarbonate three drachms to a pint of freshly prepared distilled water and properly sterilised, given per vein, may be of good service. Generally one pint of the above saline may be quite enough for the time being, but in some bad cases even upto one and a half to two pints may have to be given. In cases of acute uraemia ten to fifeen ounces of a four to seven per cent sodium bicarbonate solution in distilled water, better in normal saline, may have to be given. Now a days one can get ready made ampoules of seven and a half per cent solution of sodium bicarbonate for immediate use in these cases. One of the best guides as to whether more sodium bicarbonate is to be given in a particular case is to be found in the acid reaction of the urine.

Preparation of Alkaline Saline.

Dry powder of measured quantity of pure sodium bicarbonate, can with ease, be baked on an aluminium, or some metallic dish, over the flame of a spirit lamp and thus sterilised before being added to slightly warm sterile saline, just ready for use.

Dry autoclaving in packets may also sterilise the sodium bicarbonate powder, thus making it ready to be mixed with sterile saline. Calcium chloride, by forming a pricipitate with the alkaline saline is incompatible when added to it. Calcium can be given separately according to indication either in the form of gluconate or in other forms. *Alkaline saline should never be given subcutaneously or intramuscularly as it causes the most severe and dangerous sloughing of the tissues, when so given. This fact should never be lost sight of.*

14. Ind. Jour. of Med. Research, (1915). ii. p. 867.
15. Rogers, (1917). Lancet ii: p. 745.

A few practical details. In all cases of cholera, specially with collapse, due to dehydration there is much need for water in the tissues, and as already discussed there is always some loss of the alkali reserve in the system. There is some hepato-renal derangement also from the very biginning.

To counteract all these the routine plan followed had been to give about a pint or half a pint, according to the severity of the dehydration etc., of the alkaline normal saline with glucose first, then in the same sitting, through the same apparatus, one and a half to two pints of either Roger's hypertonic or one per cent saline solution according to the indication of that individual case. The rationale is that the hypotonic alkaline glucose saline having six drachms of glucose, three drachms of sodium-bicarbonate and one drachm of sodium chloride, to a pint of freshly prepared distilled water, when given initially, goes a great deal to build up the alkali reserve and even to prevent acidosis and help in the out-put of urine. It also gives, ready food and fuel to the heart and the exhausted and dehydrated system. This besides other effects, tends to counteract the hepato-renal derangement generally associat ed with cholera.

As a matter of experience one gradually finds that early administration of glucose, alkalines and hypertonic or even one per cent saline and plasma in severe cases started from the very beginning of collapse in cholera appears to give better results than those to be got by the older methods of treatment of only hypertonic saline transfusion, followed by the subsequent use of alkalies.

Repeated Collapse. When repeated collapses occur at short intervals, one should expect considerable loss of sodium-chloride from the system, because in the presence of sufficient amount of sodium chloride which tends to keep water in the tissues, such repeated collapses would be very unlikely, hence in a case in which repeated collapses take place in a few hours time after the onset of cholera, there is greater indication of giving hypertonic or even one per cent saline first, then alkaline hypertonic saline with glucose. The amount will vary according to the specific gravity of blood, blood pressure, degree of dehydration, presence of cramps or not etc. Human plasma is specially indicated in these cases of repeated collapse due to dehydration and shock.

Every cholera case is a potential uraemic.

Calcium is specially indicated in these cases of repeated collapse, as it tends to lower the permeability of cells, and also due to its other beneficial effects.

Conditions where intravenous Saline is either contraindicated or should be given with caution.

(1) High rectal temperature. (2) Weak heart, or in elderly persons or in valvular damage, in epidemic dropsy with weakness of the heart, oedema of the tissues etc. (3) In subsequent collapses, where the specific gravity of blood is not raised, but the blood pressure is low, here the most probable cause of collapse is in cardio-vasomotor weakness. (4) In pulmonary complications, or in the presence of lung diseases or in oedema lung etc. (5) In marked tympanites. (6) In pregnant patients of cholera. (7) In weak, children, it should be given with care, or only subcutaneously.

RIGOR.

Probable causes.

(a) *Discrepancy between the temperature of the saline and that taken in the rectum,* lower temperature of the saline does not cause so frequent rigors, hence the remedy lies in giving saline at a comparatively low temperature.

(b) *Too rapid flow of the infusion* probably by (i) irritation of the vascular endothelium (ii rapid distension of the capillaries.

(c) When the *concentration of the saline is too high.*

(d) If the *distilled water is old,* the bacterial bodies grown in the water cause mild protein shock, specially as the water goes directly into the veins. Hence the importance of giving salines prepared in fresh distilled water wherever available.

(e) The intravenous saline transfusion is not an unmixed blessing, because once the circulatory equilibrium is established, toxins from the intestines are absorbed, and may be one of the factors in giving rise to the rigor.

Hyperpyrexia, when observed by taking rectal temperature, before starting treatment, as is not uncommonly seen in cholera amongst Europeans, must be brought down by either cold sponging or ice packing or iced rectal saline,

and after rectal temprature has come down to near about 100° or 101°F then room temperature or even preferably cool saline, at about 60° to 70°F may have to be given.

We have found as a matter of experience that it is far better to leave the patient alone in the collapsed condition and to give only subcutaneous or rectal saline, than to give intravenous saline transfusion in cases with high rectal temperature.

SUBCUTANEOUS SALINE.

Indications. 1. In cases of evidence of cardiac weakness, or damaged heart with valvular disease etc., where intravenous saline may even kill the patient.

2. In the presence of any pulmonary trouble.

3. In the presence of hyperpyrexia with a raised rectal temperature, there is considerable risk in giving saline intravenously unless the temperature of the patient is first lowered down.

4. In cases where collapse succeed rapidly, the intravenous saline should be supplemented by those given subcutaneously. Here though the absorption is slow, yet the effect is more lasting.

5. In cases where the specific gravity of blood is not much raised and the symptoms are not very urgent, subcutaneous saline injection, is one of choice in treatment.

6. In cases of bad tympanites intravenous saline should be given with much caution as it may render the condition worse.

Site to give subcutaneous saline. The best place to give subcutaneous saline is under the skin of the abdomen or the outer side of the thigh or in other lax tissues of the body. In women, under the skin by the side of the breast or in the lax tissues of the abdomen. The subsequent asepsis should be perfect.

Some disadvantages of subcutaneous saline. (i) It is slow in absorption, but more lasting in effect.

(ii) Sepsis and even cellulitis are not uncommon unless careful aseptic measures are taken.

(iii) Very painful.

(iv) Preferably only isotonic saline should be given subcutaneously. Hypertonic saline though it causes some irritation of tissues locally, may also be given subcutaneously.

CHOLERA IN PREGNANT WOMEN.

Pregnant patients of cholera nearly always miscarry. This is almost invariable in all severe attacks. One out of our fifteen cases did not do so. What factors in the treatment can prevent this, it is difficult to say. Generally, if proper treatment is begun, quite early in the disease, the risks may be, to a great extent, minimised.

In the treatment of cholera in pregnancy, one mainly depends on subcutaneous saline, unless the symptoms are very urgent. Even where symptoms are urgent one should be very cautious in giving more than one pint of alkaline glucose saline per vein. The rest of the saline even a hypertonic one may be given subcutaneously. The intravenous saline should be given as slowly as possible. Human plasma given I. V. in small quantity say 100 to 200 c.c. should be tried in severe cases.

The ideal treatment would be to give subcutaneous saline before dangerous collapse starts, *i.e.* as soon as the specific gravity of the blood shows a rise by few points, and signs of moderate dehydration become manifest. The intravenous, preferably the closed method, being left only for alkaline glucose saline in small amounts, at more frequent intervals. Calcium gluconate and glucose every few hours per vein, is specially indicated in these subjects. Subcutaneous saline injections should be supplemented and strengthened by regular Murphy's drip method of alkaline saline with glucose, given rectally.

SALINE IN CHILDREN.

In children inspite of very severe collapse the specific gravity of blood may not be raised much above normal. One may see quite a good percentage of pulseless children in cholera, with a specific gravity of blood near about 1060 to 1062, or even lower. As a rule children, whose volume of blood in the system is comparatively small, tolerate intravenous salines rather badly, hence even where symptoms are very urgent not more than as many ounces as their year of age, should be pushed. It is always better and preferable that children should receive saline subcutaneously and rectally, the latter route being specially suitable for alkaline glucose normal saline. Sodium bicarbonate in a four per cent or the ready made ampoules of seven and a half per cent solution available now a days, prepared by some dependable firm, may be mixed up with suitable amount of sterile

glucose solution and given intravenously where there are indications of uraemia, anuria, or in fully developed uraemia.

Amount of Saline in Children. The safe plan, as to the amount of saline to be given, is roughly by the age. One generally gives as many ounces as the number of years or a little more. Say for a boy of ten years one should give roughly either eight to ten ounces subcutaneously. If the symptoms are not very urgent one may give about sixteen ounces subcutaneously and alkaline glucose normal saline about two ounces, every three hourly rectally, according to indication. Plasma as in pregnant cases need be tried in smaller quantities.

Important practical details. All these salines for injection should be properly filtered either through sterile filter papers or filtered while hot or better still through boiled and thus sterilised fine muslin, or through a pad of sterile cotton wool. All the articles and the saline should be properly sterilised before transfusion. The hands of the doctor, utensils and other instruments as well as the skin of the patient demand surgical asepsis.

Calcium is specially indicated, besides its routine use, in cases of repeated or prolonged collapse, in pregnant patients, in cases of pink or bloody stools, in cramps, in undue irritability of the nerves, in weakness of the heart and lung, in elderly patients, etc. As it lowers the permeability of all cells and membranes, is of much use in all cases of cholera.

Alkalies and Glucose. As already mentioned they are of considerable service in the treatment of all cases of cholera. They tend to prevent, when started early in the disease, anuria, uraemia, and correct the loss of alkali reserve of the system. They are invaluable also for the treatment of cholera at its later stages.

Bacteriophage and cholera antisera etc., have not proved themselves of much use in practice. Sulphaguanidine is certainly more efficacious.

Cramp. As already discussed, is extremely painful and agonising. It starts first in the extremities, then appears in the abdominal muscles.

Treatment consists in combating the dehydration, the main cause, by saline infusion, calcium is of special use in

these cases. Warmth and massage with bland oils or mild counter-irritants may keep up good blood supply, and thus relieve this very painful symptom of cholera.

Collapse due to Cardio-vasomotor weakness. The main indications are for the stimulation of the heart and the vasomotor system, though generally the results are some what disappointing.

Under these circumstances intravenous saline is as a rule contra-indicated, only where urgently needed the subcutaneous route for hyper or isotonic, and the rectal route for the hypotonic or isotonic alkaline saline with glucose should be chosen. Small transfusions of Lyovac dried plasma solution may be tried and effects carefully watched.

SOME COMMONLY USED DRUGS FOR THE HEART AND THE VASOMOTOR SYSTEM.

Digitalis group. Are more or less not of much use.

Adrenalin. Given orally under the tongue, or ½ c.cm. by intramuscular injection is useful, only a fresh and reliable preparation is a good vasomotor stimulant and helps sometimes in the subsequent flow of the urine. It is generally effective, may be repeated and it dilates the coronary vessels of the heart besides raising the blood pressure, but the action is very transitory. In urgent cases of sudden collapse about half a c.cm. may be given per vein in saline. Cortial extract injection may be of use.

Pituitrin. It is of lasting effect and a good diuretic. It should not be repeated before eight to twelve hours, useful also in bad cases of tympanites. It is generally given in half to one c.cm. doses subcutaneously every eight to twelve hours.

Caffeine Sodium Benzoite, in two to five grains intramuscularly every four to eight hours, is a good diuretic, cardiac-stimulant, and coronary dilator. For diuretic purposes it should be given after the other defects such as altered crystalloid and colloid content of blood, dehydration etc. have been properly attended to.

Camphor Groups. Such as solu-camphre or camphor in ether or oil, cardiazol, cardiazol ephedrine etc. are useful, but one should remember the irritant effect of camphor on the kidneys.

Cardiazol group may also be given orally. Coramine, cycliton are recent cardiac stimulants.

Atropine Sulphate, was used by Rogers, subcutaneously in usually 1/100 to 1/200 gr. for an adult as a routine method morning and evening in all collapsed cases to lessen shock as suggested to him by Lauder Brunton.

In practice now it is not given as a routine. One watches the case, if there is a tendency in him to keep up a high temperature or tympanites atropine is withheld. For hyperpyrexia with weak heart intravenous strophanthin with plenty of glucose, or camphor derivatives, nikethamides, cold applications are useful.

Atropine and Tympanites. For tympanites turpentine stupes or 1/150 gr. of physostigmine and strychnine in 1/60 gr. doses subcutaneously may help the expulsion of the flatus and stool. Flatus tubes and turpentine stupes should always be tried at first for the obstinate tympanites of cholera. Pituitrin also is a valuable drug in this condition. Prostigmin injection may be the last resort.

In children having cholera and intestinal worms, hot water bottles wrapped in towels or thick linen, may be of use to relieve the tympanites.

Uses of Atropine Sulphate. Generally one gives atropine sulphate in 1/100 gr. to an adult every eight to twelve hours when the patient has a low temperature and no tympanites. Specially it is indicated in weak or debilitated or elderly persons, who generally show weak-heart or any disease of the resporatory system. Oedema of the lungs specially calls for atropine treatment. Seldom it is required before the first injection of saline.

Strychnine. It is of special service in respiratory involvement and as a general stimulant in asthenia, weakness etc.

Mechanical devices for the cardio-vasomotor weakness.— See page 144 etc.

Hot water bottles. They are generally used almost in the same conditions as an electric bath where the latter is not available. They are of considerable service in cases during the winter and in persons with a low or subnormal temperature.

ANURIA AND URAEMIA.

Anuria. It is quite common and may be accepted as a symptom of cholera. It demands the same, but somewhat milder treatment than that of uraemia. As the causes of both anuria and uraemia are identical, they are not discussed separately. See page 98 in blackwater-fever.

URAEMIA—treatment should be according to cause described under diagnosis of cholera.

Raised non-protein nitrogen content of blood. In 1930[16] it was shown by us that practically in all cases of cholera there was raised non-protein nitrogen content of the blood specially at the later stages. Patients showing a very high rise of this constituent of blood had a proportionally higher death rate. Injection of saline, alkalies and glucose, also eliminatory and other useful methods of treatment are of service.

It is this rise of non-protein nitrogen content in cholera that prompted us not only to use castor oil freely, but also to try small doses of sodium and magnesium sulphate[17] in post choleric uraemia with somewhat promising results.

Toxic action on the kidneys. This action is considerable in cases of virulent infection by vibrio cholera. It to a certain extent is counter-acted by the automatic purging and vomiting which helps by eliminating the toxins.

Too low blood pressure. See page 98 also.

Delay in starting treatment, while in collapse.

When this is due to too low a blood pressure originating from cardiovasomotor weakness, proper stimulation is indicated.

Loss of alkali reserve.

Glucose, sodium bicarbonate in one per cent saline, in liberal amounts taken in sips per mouth are of service in this direction.

One should also remember that there may be alkalosis

TREATMENT BY ELIMINATION IN URAEMIA.

To promote kidney secretion.—See page 98—anuria of blackwater-fever etc.

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16. Dhar, and Adhyee, (1930). Role of non-protein nitrogen etc. Cal. Med. Jour.
17. Dhar, (1932). Outlines of the principles of rational treatment of cholera etc. Jour. of the Ind. Med. Ass.

Amount of Urine is important. One of the best guides in the prognosis, in cholera, is the *amount* and not the frequency of the urine. The quantity of urine should always be measured in the presence of the doctor. *A free flow generally means that the patient is more or less out of danger,* provided other complications or untoward symptoms are absent.

Bowels. They should not be allowed to be locked unless there is free secretion, say forty to fifty ounces, of urine daily. A case with coated dry tongue and not very alert mental state, with scanty urinary secretion and locked bowels, may pass into the uraemic stage in a few hours, hence the importance of keeping the bowels open by either castor oil or by mild saline purges.

Treatment of some of the commoner complications.

Sepsis and Cellulitis. They do occur, unless very scrupulous asepsis is observed in giving the saline injections.

Bronchopneumonia, Oedema lung etc.

They should be treated on the usual lines of all bronchopneumonia. The remedies of special service are:—

In oedema lung or other lung complications intravenous saline is contraindicated. In these cases subcutaneous, rectal and oral salines should be taken resort to.

Parotitis. For treatment one may see this complication occuring in typhoid fever. See page 130 for details.

Jaundice. Bowels should be kept open. Alkaline mixture, sodium salicylate, urotropine orally, as well as per vein, glucose, decholin and others may be of service and should be given according to indication. Cholecystitis demands proper focal, local, and systemic treatment.

Hiccough, should be treated according to the cause. The fault may be in the loss of alkali reserve of the blood or in local irritation or, such other matters. Its causes should be remedied.

Corneal ulcer. Not infrequently, it is due to the eyes remaining half open, even in the stage of coma; drying up of cornea, and injury by flies, may be the potent causes of this ulceration. Treatment consists in applying either an ointment or drops of liquid paraffin into the eyes, at frequent intervals and protecting them from flies, dusts and dirts.

Fever. May be due to coli infection of the urinary tract. Other causes of fever demand appropriate treatment.

Asthenia. Not infrequently, even after the immediate symptoms are over, the patient fails to get better, and dies gradually due to asthenia.

In these cases supporting and stimulant line of treatment is of some use. Transfusion of plasma and/or protein hydrolysates may be useful.

A FEW IMPORTANT GENERAL POINTS.

The patient should not be disturbed without reason, the teeth, mouth, eyes, ears etc. need due attention. Bed sores septic complications are badly borne, hence should always be avoided. Rectal and axillary temperatures, pulse rate, blood pressure, amount of urine, number of stools etc. should be carefully recorded. The stools and urine need proper examination in all cases.

FOOD AND DRINK IN CHOLERA.

Green cocoanut water in liberal amounts, wherever available is a soothing drink.

Thin barley water, with lemon juice, adding to the alkalinity of the system, with common salt, is useful.

The intense thirst often prompts the patient to drink a lot of water at a time, only to be vomited out. So it is advisable to give all fluids in sips and in small portions, at frequent intervals, otherwise the patient will eject them out.

Liberal amounts of *alkaline saline with glucose* should be given, orally whenever the patient can retain it.

Plain gluocse water, with or without lemon juice some times *sugar-candy water or sugar cane juice,* may be allowed in suitable cases.

Small bits of ice are sucked by the cholera patient with gratification of the thirst, though often temporarily.

During Convalescence : Reversion to solid dietary should be somewhat cautions, and very gradual, specially in view of the ravenous appetite of the cholera convalescent. One should stop things in dietary which disagree.

Butter milk, or skimmed milk, or peptonised or citrated *milk* or diluted milk may be given accodring to the suitability of the case.

Decoctions made out of beaten paddy, (Chira or Chipitok) with either sugar or lemon juice and salt, may be liked by the patient.

Gradually one adds to the diet of the convalescent, soft boiled rice with butter-milk; then soft rice and simple curries without spices and fats, thus reaching gradually and by steps to the normal dietary of that individual.

Usual Causes of Death in Cholera.

(a) Virulence of the attack with intense toxaemia and lack of resistance in the patient. (b) Lack or undue delay etc. in proper treatment. (c) Uraemia. (d) Some of the graver complications. (e) Already damaged kidney, heart, lung etc. (f) Asthenia, sepsis etc. (g) To treat habitual opium eaters is difficult.

CHAPTER XXXVII

BACILLARY DYSENTERY

General. Bacillary Dysentery is an acute, sub-acute or chronic infectious disease, occuring sporadically, endemically, or in more or less severe and wide spread epidemics caused by the dysentery group of bacilli,[1] clinically there are frequency of stools containing blood and mucous, toxaemia, tormina and tenesmus. Anatomically noted are catarrhal, pseudo-membranous and ulcerative lesions of the large intestines specially of the sigmoid colon and rarely extending upto the lower portion of the small intestine. It varies in severity from mild attacks to fulminant gangrenous types.

Diagnosis. Early recognition of the disease is of such importance for effective treatment, that it is quite justifiable to institute sulphaguanidine on the basis of provisional clinical diagnosis, before it is confirmed bacteriologically.

During an epidemic the diagnosis is usually not difficult. The typical onset with fever, toxaemia, pain and tenesmus, together with frequent stools containing blood and mucous, tenderness over the sigmoid colon, are sufficient to provide a diagnosis to be confirmed later by bacteriological methods. Leukocytosis of blood is common. Macroscopically the stool is fluid, mixed with mucous and is of red colour gradually turning to the mixture mainly of blood and white semiopaque mucous, and practically no faecal matter.

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1. Perry and Bensted, (1929). Trans. Roy. Soc. Trop. Med. and Hyg. April 25, 1929. p. 511.

Microscopically there is a massive leukocytic exudate consisting mostly of degenerated polymorphonuclears (neutrophiles), red blood corpuscles, macrophage cells and white blood cells which may have been almost completely degenerated.

But final diagnosis has got to be made by cultural and serological tests.

Differential Diagnosis has got to be made from entamoebic dysentery, intussusception, and other forms of dysentery, cancer rectum, tuberculosis of the intestines, cholera and others.

Complications commonly are, arthritis, iritis, conjunctivitis, iridocyclitis, tachycardia, peripheral neuritis, peritonitis etc. The joint fluid is as a rule sterile.

TREATMENT

Prophylaxis. This is based on the methods of infection. The same measures, as are adopted to prevent the spread of typhoid fever should be undertaken. The patient should be isolated, all secretions and excretions disinfected Other precautions for all infective diseases of the bowels should be observed.

Prophylactic vaccination. This appears to be of some value,[2,3] but as yet no universally applicable method has been evolved out. Recently Prigge (1940)[4] suggests oral vaccine of the shiga, flexner and sonne group based on encouraging results on animals experimented upon.

General. As regards absolute rest, choice of the room, nursing, bed, disinfection of the stool etc. the same measures as are adopted in cases of typhoid fever should be taken. But in acute bacillary dysentery, the patient may feel urgency for stool even on slightest movement such as turning from side to side, hence the importance of absolute rest in bed, without any movement. The body should be kept clean after each stool, which must always be passed in a bed-pan and in lying position. Flies should not be allowed to sit on the excreta which should be disinfected

2. Corner, (1935). Lancet. ii. p. 1162.
3. Pergher and Van Reil, (1933). Bull. Soc. de. Path. exotique 26: No. 1. p. 46.
4. Klin. Wochen. Berlin (1940. April. 13) p. 337.

as soon as possible. The linen, garments, bed clothes require proper disinfection. The *skin* round the buttocks, anus need be *kept dry* by properly powdering, after application of methylated spirit. Chilling of the abdomen is detrimental, and is best avoided by keeping the belly constantly covered either by thick linen, flannel or some suitable clothing, wrapped round and fixed on the abdomen by safety-pins.

Diet etc. This should preferably be liquids. The workers in the Tropical school of Medicine, Calcutta, urge that in cases of shiga infection, which shows more acute signs that in cases of shiga infection, which show more acute signs and symptoms, arrow-root or barley water, sago, glucose, rice gruel or in other words a carbohydrate diet is indicated, whereas in flexner type of infection, less starch and more of protein diet, such as milk and its preparations, whey, albumin water, soup, egg boiled or poached, minced chicken, milk casein etc., are suitable. Plenty of fluids should always be given because there are real risks of dehydration due to repeated purging.

Specific Therapy :—

The remarkable therapeutic efficacy of *sulphaguanidine in bacillary dysentery* in proper doses for 4 to 7 days or longer, (the earlier in the disease treatment started the better is the result) has proved to be a specific. For details see pages 31 and 32. It is very slowly absorbed from the intestine hence should be given with plenty of water, alkalies etc. Phthalylsulphathiazole (May and Baker) sold under the names of thalistatin (Herts Pharmaceuticals) sulphathalidine (Sharp and Dohme) four to six tablets initially followed by two to four tablets four hourly in an adult has also proved very efficacious in the treatment of bacillary dysentery. Ulcerative colitis however requires smaller doses For details see page 33.

For eradicating the carrier stage :—

Succinyl sulphathiazole or sulphasuxidine in 0.25 g doses per kilo of body weight for seven days was effective in eradicating the carrier stage in a group of cases of sonnie dysentery. Phthalyl-sulphathiazole is also expected to do the same if not in a better way.

Bacteriophage,[5] *Saline purgative and Serum* in the treatment of acute bacillary dysentery are being replaced

5. Painton and Hantman (1946 Aug. 18.) Jour. Amer. Med. Ass. 128. p. 1152.

by the recent specifics, like sulphaguanidine, sulphathalidine etc.

In chronic cases besides specific treatment by *sulpha-drugs, streptomycin injections are expected to be of much use.* For details see page 68. Alternate use of half a dram to a dram each of Soda sulph and Mag sulph with 20 drops of tincture hyoscyamus, and bromides and pot. citrate per dose according to indication every 6 to 8 hourly for a few days followed by a few days of combined sulphaguanidine and sulphasuxidine therapy may do good in chronic amoebic dysentery or in mixed infection with bacillary, initial sulpha-drug therapy of a thorough type when followed by emetine injections and other amoebecidals the results are more lasting. For details see chapter on amoebic dysentery. Recent[6] work appear to show that bacteriophage is useless in the infection caused by bacillary dysentery organisms.

SYMPTOMATIC TREATMENT.

Tympanites and diarrhoea etc. Kaolin or animal charcoal, either alone or both combined may be used when the purging is exhausting. They both act by adsorbing toxins.

Pain and Distress of the bowels. Normal saline bowel wash of one pint, slightly warmed may be soothing, to this about five to ten drops of tincture of opium may be added, provided the patient is not a child. Astringent enemata such as normal saline with alum ten grains or tannic acid ten to thirty grs. per pint may be soothing, specially before the patient retires for the night. The old starch opium enema made up of,—

Tincture opium	m.	30
Starch boiled	upto. fl. oz.	2

may be used with advantage. But for younger patients the dose of tincture opii should be reduced according to the age, body weight and so on. The lower bowels should be washed first to cleanse the parts so that these medicated enemata may come in intimate contact with the mucosa and exert their astringent action. Uzara (liq.) in twenty to thirty drops thrice daily, eupaco, one tablet every six hourly

6. Boyd and Portnoy (1944) Trans. R. Soc. Trop. Med. Hyg. 37. p. 243.

may be tried notably in griping, colic, pain and diarrhoea. Morphine and atropine in proper doses may be the last resort. For great pain distress injection of morphine and atropine in proper dosage is the most effective therapy.

Dehydration and Collapse. These demand the same methods of management by saline transfusions and stimulants as in cases of cholera. Atropine injections, warmth locally etc., are of use too. Orally plenty of fluids, glucose drink, alkalies etc., should always be exhibited.

Cardiac Weakness may require the free use of diffusible stimulants like cardiazol, veritol, camphor in oil, or ether, etc. Glucose insulin injections may be required in bad cases.

Convalescence. As the patient's symptoms improve, according to his digestibility taste and appetite, gradually and cautiously solids should be added to his dietary.

During convalescence constipation should always be avoided, either by such suitable simple agents as "trifola water" on "Ispaghula" (plantago ovata) or "bael fruit," or "papita" etc., but to be sure one may give either liquid paraffin or some suitable combination, such as petrolagar, angier's emulsion or agarol etc. Soft consistency of the stool is to be ensured to prevent kinking, constriction or other troubles inside the gut. Cascara, saline purges, senna may be also useful for this purpose.

CHRONIC DYSENTERY

TREATMENT.—

Chronicity. Chronic cases may show various manifestations. Investigation should be made, besides clinical manifestation by 1. repeated examination of stools, 2. culture and agglutination test from organisms in stool, 3. sigmoidoscopy, 4. barium enemata and skiagram and so on.

The treatment of chronic bacillary dysentery is discussed under specific therapy at the *beginning of this chapter.*

Diet. Should consist mostly of proteins instead of carbohydrates. Fish, eggs, meat, milk and preparations, like curd, butter-milk, etc., are suitable. Symptomatic treatment should consist of relief of symptoms as they arise. Lactic acid bacilli, or butter milk or sour milk or curd. "Dahi" may prove useful. Bael fruit, ispaghula, etc. are often suitable.

Relapse. On the first appearance of any symptoms like griping, pain, diarrhoea, tenesmus, or mucous and blood in the stool with or without fever, sulphaguanidine should be exhibited six times daily or more frequently, according to the severity of the case. The acuter the disease the greater is the need for more frequent administration of sulphaguanidine.

Sequelae, such as chronic dyspepsia, indigestion, weakness, emaciation, nervousness, depression etc., demand the lines of treatment chalked out for chronic cases. In these persons, as the general systemic exhaustion is shared by glands of internal secretion specially the thyroid, extract thyroid siccum, is worth trying in intractable cases, in half to one grain doses twice daily for four days in the week. The patient's general health should be improved by all means. Change to a better and more bracing climate may be of some effect. The tone of the abdominal and intestinal muscles suffer considerably in these chronic cases.

Constant strain on the splanchnic nerves, the brain of the sympathetic nervous system, tends to make the most composed of persons nervous and peevish. These demand local as well as systemic measures, notably for the improvement of the general health and resistance of the individual, by good diet, iron, vitaminous tonics etc. specially B complex to increase the tone of the intestines.

CHAPTER XXXVIII

AMOEBIC DYSENTERY AND HEPATIC NECROSIS

General Description.—

"Entamebic dysentery is a wide-spread disease of infectious origin, caused by invasion of the structures of the large bowel by the Entameba histolytica, a specific protozoal organism belonging to the group of Rhizopoda. The clinical course of the disease is marked by a considerable irregularity and inconstancy of symptoms. There is an acute or sub-acute phase, characterised by frequent, scanty evacuations, often containing mucus and blood, by abdominal pain, tenesmus and general bodily depression. This phase is followed by variable periods of latency, during which the clinical phenomena remain for the most

part in abeyance. Anatomically the most characteristic feature is an undermining of the sub-mucosal layer of the large bowel subsequently extension of the ulcerative process takes place into the mucosa and, with less frequency, into the muscular and peritoneal coats. Remote infections usually ending in suppuration occur not uncommonly in the liver, spleen and even in the brain, the specific organism reaching these organs by way of the blood stream from the original focus of infection in the intestinal tract."[1] Amoebae may travel by the lymphatic channels and also directly to the distal organs like liver, spleen etc.

During the rains the cysts passed in the stools of the carriers are washed into the sources of drinking[2] water and by this means and also by fingers, food, fomites, filth and flies the cysts enter the human alimentary canal and after an incubation period of a few weeks to a few months, the symptoms appear, though the clinical manifestations are extremely variable.

Acute onset. In about one half of the cases the onset is acute. Some are really acute from the beginning but others may have existed for some time as latent, mild or moderately severe infections. Ulcerations might have been present before the onset of sudden diarrhoea. Headache, nausea, chill may usher an attack. Soon follows spasms of griping pain in the intestines followed by frequent loose motions. *In a mixed type of infection* which is common there may be some fever, and variable number, from fifteen to forty or more stools a day. Some leukocytosis is generally present. The pain is intermittent and colicy, felt over the umbilical region of the abdomen, sometimes rectal and vesical tenesmus occurs, particularly in mixed types, the bacillary infection, causing ulceration of the sigmoid and part of the rectum hence the tenesmus, etc.

In other forms there are variable groups of symptoms, ranging from alternate diarrhoea and constipation, early morning diarrhoea, symptoms of frank but intermittent dysentery or those of one of the complications may sway the field. Pain and griping, specially during or just before defaecation, pain or heaviness in the region of the liver,

1. Simon, (1927). Entamebic dysentery, Practice of Medicine, edited by Tice. Vol. IV. p. 271.
2. Medical Annual, (1937). p. 24.

dyspepsia are suggestive and should lead to the examination of the stool. In severe forms gangrene of the large intestines may follow.

Clinically. Besides cases showing more or less obvious and frank manifestations of dysentery there are many others who complain of vague signs and symptoms which unless carefully remembered may lead to errors and over-sight.

Diagnosis. For the purpose of diagnosis the entamoebae should be seen microscopically, better living and motile. The stool should be fresh after a saline purge, may have to be examined for several consecutive days. Small pieces of mucous are the best materials for such purpose. Soon after passage of a motion the movement of the amoebae cease and they die, then it is not always possible to spot them out. When the stools are fluid considerable number of these organisms may be met with. Not uncommonly apparently healthy solid stool, containing a few shreds of tenacious mucous hanging around may show plenty of entamoebae in the vegetative form.[3]

Sigmoidoscopy. Examination by this instrument may be of great assistance in diagnosis in some cases. Cales and[4] Froussard in their series of two hundred cases recognised amoebic lesions in twenty-five per cent with the aid of the sigmoidoscope.

Charcot Leyden Crystals are found in from twenty to thirty per cent of amoebic dysentery cases and Thomson considers their presence to be diagnostic of amoebic as opposed to bacillary dysentery.[5] But recently Tribedi and De have not found them to be so frequent.

Skiagraphic Examination. Vallarino[6] and others (1925) advocate skiagram examination of the large intestines after barium meals and enemata. Mottled appearance of the large gut, according to them, is highly suggestive of the lesions.

Amoebic dysentery has got to be differentiated from bacillary dysentery, ulcerative colitis, carcinoma colon, other diarrhoeas etc.

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3. Tribedi and De, (1938). Brit. Med. Jour. May 7th., p. 1000.
4. Strong, (1925). Amoebic dysentery; Osler's Modern Medicine. Vol. II. p. 269. Lea and Febigers.
5. Ibid. p. 279.
6. Amer. Jour. Trop. Med., (1925). 5 : p. 149.

Sequelae of amoebic dysentery, are cicatrices, atrophy, adhesion, kinking etc. of the gut. There may be improper absorption of food material, leading to liquid copius, pale, usually big frothy stool resembling sprue. There may be atrophy of the mucosa of the tongue which looks red and shiny etc. Morbidity for the rest of the patient's life, specially when left untreated for a long time, is not uncommon. Even after treatment chronicity is the rule than the exception. Some relation of appendicitis as a complication of amoebiasis has been recently discussed by Banarjee, Chopra and Roy[7] (1936). Intestinal tumours of amoebic and bacillary origin are being described, for details see end part of treatment etc.

TREATMENT

General measures. Rest preferably in bed, warmth, specially to prevent any local chilling of the abdomen and the body as a whole is useful. For the former purpose covering the belly with a suitably warm flannel binder is adequate. *Liquid diet,* such as glucose-water with lemon juice skimmed milk, butter milk, sugar-candy water, whey, soups, broth etc., are suitable for the acute stage. Solids should be added to the dietary very gradually and cautiously. A person suffering from amoebiasis should strictly avoid alcohol, hot curries and other irritants as these increase the risk of hepatitis and hepatic necrosis.

Castor oil, emetine etc. Injections of emetine have, to some extent an irritant laxative effect on the intestines, consequently the preliminary purges are not given by many doctors. In the average case, which is more or less subacute or chronic in nature, clinically better results follow when daily a preliminary dose of castor oil, is given early in the morning followed by emetine injections and an alkaline mixture orally. Castor oil is generally given in something like the following prescription :—

Oil Ricini	m. 240
Pulv Gum Acacia	q. s
Tr. Hyoscyamus	m. 30
Ext. Kurchi Liquid	m. 90
Syrup Auranti	m. 90
Aqua menthpip	upto. fl. oz. 1

7. Ind. Med. Gaz., (1936). 71 : p. 693.

one dose early in the morning, or twice daily, morning and evening in bad cases. The extract kurchi liquid is said to be a useful remedy against amoebic dysentery.

Emetine when given early in the disease in adequate doses and followed up by other amoebacides the result of treatment is likely to be good. It is a powerful and effective drug, and there are a few susceptible persons who may show asthenia, cardiac weakness, rarely even polyneuritis, after injections of usual doses of emetine. But fortunately there is hardly any such trouble with the average healthy person.

Though various plans have been worked out in giving emetine, yet for an average healthy Indian adult one grain daily till six such are given may stop most of the symptoms. After this course, for majority of cases three more one grain daily dose may have to be repeated after a rest period of one to two days without the injections. The last three doses should be given provided no untoward symptoms or extra weakness is complained of by the patient as a result of the six grains of dependable emetine given already. Injections given subcutaneously at different sites, or intramuscularly into the buttocks, and fomented immediately afterwards give some pain. The brand of emetine used should be of the best type available, otherwise there may be intolerable pain following injections.

As we know well now, that it is extremely difficult to eradicate the amoebic infection once it has passed beyond the acute stage, it appears unjustified to push a powerful drug to the limit of mild toxicity, but this should not be interpreted as recommending sub-therapeutic dosage of this useful remedy.

In very acute and urgent symptoms or in amoebic hepatitis half a grain of emetine hydrochloride is to be injected every eight hourly, thus making a total of one and a half grains per day for the first two days, then the same dose, once every twelve hours, that is, one grain per day, till six to nine grains of the drug are exhibited. This plan appears more effective in the above types of cases than one daily injection of a grain.

Precautions. Though most workers advocate only alkalies in big dose during the whole period of emetine treatment, yet a mixture or powder containing calcium, alkalies

and glucose in proper proportions appears to act better, to counteract the injurious effects of the drug.

It is to be borne in mind that the toxic and deleterious effects of emetine are made much worse when the patient is ambulant than when he is confined to bed. Hence it is of importance to see that the subject lies in bed all the while the injections of emetine are going on, specially when he complains of weakness or palpitation or any such symptom.

Brown[8] (1933) of the Mayo clinic has recommended an intensive method of emetine treatment. His plan consists in giving injections of one grain every eight hours, that is, three grains on the first day; one grain every twelve hours amounting to a total of two grains on the second day; then one to two grains on the third day. Emetine according to him can be given intravenously but subcutaneous[9] route is quite effective enough, hence it is better not to run the risk of intravenous therapy. Three grains per day is certainly a very risky dose for an average Indian patient. One and a half gr. is the maximum that one has given to our patients of average built.

Emetine bismuth iodide group. Emetine bismuth iodide in two grains, either in hard gelatin coated capsules or floated in two drams liquid paraffin, last thing at night, with one-sixth grain of omnopon half an hour before each dose, is advocated in relapsing or chronic infections. It is to be given for six to twelve consecutive nights. This drug tends again to cause nausea, vomiting, and sometimes great distress to the patient. This is of particular use in chronic cases.

Emetine periodide, in capsules of two grains twice or thrice daily is said to be efficacious in chronic cases after the course of emetine is over, or simultaneously along with it. But this also has most of the disadvantages of emetine bismuth iodide.

Kurchi bismuth iodide,[10] in eight to ten grains twice daily for a week to ten days, preceded by a dose of alkaline mixture exhibited half an hour before these powders are

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8. Proc. Staff meet. Mayo Clin., (1933). 8; Nov. 22nd. p. 706.
9. Amer. Year book of General Medicine, (1934). p. 748.
10. Acton and Chopra, (1933). Ind. Med. Gaz. 68; p. 6.

said to be of use. These are sold in tablets under various trade names such as anabin, kurchibide and so on.

Liquid Extract of Kurchi. The workers in the school of Tropical Medicine Calcutta, use one to two drams of liquid extract of kurchi, twcie daily, with a little water, or combined with two heaped tea-spoonful of ispaghula (Plantago ovata) soaked in water. The bowels should be kept open by salines during this treatment.

Recent Ideas :—

Diodoquin[11] (Searl & Co.—5, 7, di-iodo-8- hydroxy-quinoline) in doses of 2 to 3 tablets of 0.2 g or 3.2 gr. each thrice daily for about 7 to 21 days according to the original disease and the result and reaction of the patient to such treatment has proved useful.[12] It is said to be a "high iodine amoebicide". Though most workers found it non-toxic and non-irritating[13] recently a few cases of furunculosis and blotchy erythema have been reported[14]. Though the main action is local on the gut-wall yet very large dose of four tablets thrice daily, for weeks seem to cause the above mentioned iodine toxidermia. Total daily dose of nine tablets. *i.e.* three tablets thrice daily for 2-3 weeks have not produced any toxic symptoms in a few of our cases. *But during the hot days one may have to be cautious and give* more moderate dosage.

In chronic Amoebic dysentery recently. Hargreaves[15] (1945) gave one lakh units of penicillin (100,000 units) initially to be followed by 33,000 units three hourly intramuscularly till 2 million units were reached, at the same time sulphasuxidine in 5 g doses 4 hourly till 80 g have been given to pave the way for better action of amoebacides, like, bismuth emetine iodide, chiniofon retention enema, diodoquin to be followed up by carbarsone, entero-vioform etc. improved apparently intractable and even almost hopeless cases of chronic amoebic dysentery. We found phtha-

11. Craig (1940. Nov.) Am. Jour. Trop. Med. 20. p-799.
12 D'Antoni (1943. March) Ibid. 23. p. 237.
13. Bercovitz (1944) clinical. Trop. Med. New York. Paul-B. Hoeber
14. Silverman and Leslie (1945. Aug. 11.) Jour. Am. Med. Ass. 128. p. 1080.
15. Lancet (1945) 2. p. 68.

lyl sulphathiazole, thalistatin etc. as useful if not better than sulphasuxidine in some of our cases.

Anhydrous lactic acid or trilactic acid.[16]—dissolves slowly in water hence when exhibited orally reaches the colon and caecum without being much affected by the gastric juice. Combined treatment by injections of emetine, oxyquinoline orally, followed by oral use of trilactic acid was efficacious in the treatment of protracted amoebic troubles.

In persistent or chronic cases a combined treatment by injections of emetine followed by oral administration of kurchi group of drugs is indicated. Besides these the other amoebacides should also be given a thorough trial. In mixed infection initial treatment by sulphaguanidine may be very useful.

Bismuth subnitrate, in heaped teaspoonful doses, suspended in a glass of water or as an emulsion thrice daily, for six weeks, in mild, and in half the dose for two to four months, always coupled with alkalies and purgatives, in chronic cases, are of use.

Chiniofon, (Sodium-iodohydroxy-quinoline sulphonate) containing 32.2 per cent iodine, though advocated by the German[17] and other[18] workers in two to three gram oral doses daily, divided into one gram each, thrice a day, yet such amounts cause too severe gastro-intestinal irritation in the majority of patients resulting in pain in the abdomen and severe frequent diarrhoea. Generally seven to ten grains (usually sold in small approximately 4 gr. tablets) twice or thrice daily may be of use. This treatment should be given for seven to ten days. It is found useful in chronic or long untreated cases but is rather expensive.

Chiniofon-Enema. A two per cent solution of yatren, used in ten to twenty ounces as a bowel wash is of benefit. For this purpose a stout catheter attached to the douche nozzle; introduced high up the rectum well lubricated, the patient lying on his left side, the buttocks raised by a pillow placed underneath the oil-cloth, may help in washing the bowels well. The emema warmed at body temperature should be made to retain as long as possible. This is

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16. Sokoloff (1945. Nov. Dec.) Rev. Gastro-enterology. N.Y. 12. p. 425.
17. Menk. (1929). Arch. f. Schiffs and Trop. Hyg. Vol. 33.
18. Reed and Johnston. (1934). Amer. Jour. of Trop. Med. 14: No. 2. March 1934.

given for a week daily, and repeated according to the result, after a rest period of seven days or so.

Entero-vioform or Enteroquinol (E. I. Pharmaceuticals) (Iodochloroxy quinolin) The American workers[19] report favourably on the proper use of this remedy. It is given in 0.25 gram. three to four times a day after food[20] for ten days. The same course is to be repeated in relapsing or intractable case after a rest period of eight days. It is also, of use in the acute cases.

Entero-vioform enema, about eight to ten ounces of half to one per cent suspension of this drug warmed at body temperature may be used as an enema in chronic cases as in yatren. It is given for about five days, with a period of rest, and repeated according to the result obtained and other indications.

Carbarsone (Lilly) (p-carbaminophenyl arsenic acid. Lilly) and *amibiarson (B.C.P.W)* both having similar[21] if not identical formula are being used with success in all forms of amoebiasis specially of the chronic type[22]. Since the introduction of this drug the old stovarsol has fallen more or less into disuse. Carbarsone contains nearly 28.85 per cent of arsenic

It is given in O.25 gram or nearly 3½ grs. in gelatin capsules twice daily after food for ten to fifteen days. No alkalies should be given along with this drug. It is efficacious in all forms of intestinal amoebiasis[23] This medicine is rather expensive for poorer patients.

Carbarsone Enema. Enema is made of six ounces of distilled water with half a dram of carbarsone and twenty-five grains of sodium bicarbonate. This is given on alternate nights, having cleanly washed the bowels by a cleansing douche previous to this carbarsone enema, two hours after the last meal at night. Some quickly acting hypnotic, such as sodium amytal, or dial, or luminal or ipral calcium

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19. David, Johnston and others. (1933). Jour. Amer. Med. Assoc. May 27th. p. 1858.
20. Bey, (1934). Jour. of the Egyptian. Med. Assoc. October. 17 : No. 10.
21. Chopra, Sen and others, (1935). Ind. Med. Gaz. 70 : 6 : p. 324.
22. Chopra, Sen and Sen, (1933). Ind. Med. Gaz. 68 : p. 315.
23. Idem, (1934). Ibid. July, 69 : p. 375.

in one to two grains given previously so that the patient falls off to sleep soon after the enema is given to facilitate perfect retention and absorption. This has got to be given on five alternate nights. During this treatment by enema the drug (Carbarsone) should not be given orally for fear of over-dosage. In no other disease one should remember more that "the therapeutic hazard in anti-amoebic therapy should not exceed the disease hazard".

LOCAL TREATMENT.

Cases with extensive lesions in the colon which do not yield to treatment by emetine and the symptoms of dysentery not very acute, are often favourably affected by treatment with irrigation of the large intestines. Their purpose is three fold, flushing out, and cleansing the surface of the lesions as well as destruction of the amoebae. Obviously the results of such treatment is effective when the lesions are lower down and within the reach of enemata. The solutions are allowed to enter slowly by gravity and the catheter passed as high as possible. The amount of fluid injected is between one to two liters. Besides the enemata of the substances already mentioned quinine hydrochloride, one in thousand to two thousand solution has been used. Some workers have tried a twenty per cent solution of cane sugar to increase the osmosis inside the lumen of the gut and thus exert a harmful influence on these parasits, through the action of the defensive juices and cells of the system.

For other serious symptoms, proper treatment is indicated.

Arsenical preparations. Calender (1935)[24] has treated cases with injections of emetine and organic arsenicals combined, with good results. But both these drugs are more or less nerve poisons hence they should better be used separately instead of simultaneously.

Sequelae of chronic amoebiasis are dyspepsia, consciousness of the movements of the gastro-intestinal tract, malnutrition, peevishness pessimism, griping, atony of the gut, notably of stomach, achlorhydria, kinking, adhesions, permanent thickening of gut and so on. They demand not only proper treatment but the mother disease, amoebiasis which made these possible need treatment with a

24 Amer. Jour. Trop. Med. (1935). March. 15: p. 189.

view to eradicate it in the lines suggested above. But one should remember that chronic amoebiasis is one of the most difficult things to cure, if cure is at all possible in such a peculiar pathological process.

Diet in chronic amoebiasis. Subjects of chronic amoebiasis should be careful in their dietary. Constipation or intestinal irritation are bad for them. Alcohol, hot pungent highly spiced foods are positively harmful and are conducive to hepatitis and hepatic necrosis. Bael fruit. papaya, ispaghula taken daily in some form are good. Plenty of ripe papaya. ispaghula taken daily in some form are good. Plenty of vitamins, fresh fruit-juice etc. and a bland non-irritating mainly protein diet, are good for them. If there is too much exhaustion and anaemia proper lines of therapy are indicated. Dry extract of thyroid in half to two grs. thrice daily and dilute hydrochloric acid and pepsin after or before meals may be useful. Takadiastase, lactopeptin, pancreatin in suitable amounts prove useful.

AMOEBIC HEPATIC NECROSIS

This condition generally known as liver abscess is now much less frequent than it was a decade or more back. There is hardly any doubt about the fact that their origin is from intestinal amoebiasis. The parasites are transported generally by the portal blood stream and cause necrosis of the liver, sometimes in multiple minute points, resulting by agglomeration into a big necrotic mass. The amoebae may also travel by the lymphatics or directly through the peritoneum to the liver. The abscess is situated in the majority of cases on the right lobe of the organ. Predisposition to this necrosis is brought about by alcohol and is stressed specially by Rogers, Megaw and others.

The important diagnostic points are a history suggestive of previous intestinal amoebiasis. During the *presuppurative stage* described by Rogers[25] (1924) there is pain in the liver region, a low fever, may be remittent or intermittent and a leukocytosis mainly of the neutrophils and large mononuclears. At this stage emetine injection will almost surely abort and cure the condition. Later on, if left untreated, the *fever* which may be overlocked unless carefully noted for, usually varying from 99° to 102°F. may be of any type. *Chill and sweat* are generally symptoms of advanced disease and may simulate malaria, tuberculosis etc. *Pain* though

25. International Confce. on health problems in Tropical America, Boston. 1924, p. 347.

commonly dull and aching, may be very sharp. It is not constant and may even be absent. *Leukocytosis* generally from twelve to twenty thousand with a preponderance of large mononuclears and of polymorphonuclears is common. The conjunctivae look slightly yellow but frank jaundice is rare. *Vomits* may occur. The skin assumes a peculiar sallow colour which is often characteristic of all liver diease as of this condition.

Upward enlargement of the upper border of the liver shows diminution of mobility or complete immobility of the right upper limit of the diaphragm. This right dome may be raised much more above the left normal side Localised dense shadow in the liver area may be suggestive. All these are x ray findings.

These abscesses may brust into the neighbouring viscera and thus show an anomalous picture.

TREATMENT

This consists in giving injections of emetine in adequate doses of eight to ten grains[26] for an average Indian of about eight stones. They are better given in divided portions, say one half gr. either every eight or twelve hours. In over—weight people of ten to twelve stones about two grains may have to be given initially in twenty four hours divided in four eight hourly half a grain doses. Orally the other drugs such as kurchi, yatren, emetine bismuth iodide may be given with advantage. Locally warmth, fomentation, poultices, antiphlogistine may be of use and when coupled with injections of emetine the relief is effective and lasting These measures along with an alkaline mixture, may abort the pathological process and spare the patient from troubles of the pus to be aspirated out.

Unless infected by secondary organisms aspiration by a suitable aspirator followed by injections of emetine is of use even in cases where much of the liver tissue is necrosed and softened. This may have to be repeated in bad neglected cases. Injections of penicillin in sepsis are useful

Hepatic necrosis usually means a somewhat deep-rooted amoebic infection which requires all the care that chronic intestinal amoebiasis deserves, and in the lines indicated above.

26. Fry, (1924). Ind. Med. Gaz. p. 488.

Other complications demand lines of treatment according to indications. Some of them are purely surgical, and under such circumstances the aid of a surgeon with experience in this line may be of real value.

Recently intestinal tumours, mostly in the large intestine, of dysentertic origin[27] *have been described.* They appear to respond to proper treatment by either amoebacidal drugs[28] or to sulphaguanidine, washes and other surgical methods[29]. Amoebic infection of the superficial surfaces after surgery of the gut wall and as well as infection of the penis[30] have responded to injections of emetine. In amoebic caecum and colon troubles simulating appendicular, tubercular and other troubles, a skiagram of the colon may materially assist in the diagnosis.[31]

CHAPTER XXXIX

GONOCOCCUS INFECTIONS

Diagnosis.

In the male. Though there may be rare innocent infection by this organism through infected towels, clothing, hands etc., yet practically almost all the cases take place through coitus. After exposure the organisms reach the orifice of the urethra and following an incubation period of average two to eight days, there begins a thin mucopurulent exudate from the urethral opening which in a short time becomes definitely purulent. The orifice with its tumefied edges, oozes thick, greenish pus, which contains besides desquamated epithelial cells, abundance of leukocytes, both neutrophile and eosinophile varieties. Gonococci quite intact are encountered in large numbers, many of them if not the majority, are contained inside the bodies of the leukocytes.

27. Silverman and Leslie (1947. April. 5.) Jour. Am. Med. Ass. 133 : p. 994.
28. Faust (1943, Dec.) Tr and stud., Coll. Physicians, Philadelphia 11 : p. 101-113.
29. Editorial (1943, April. 3.) Jour. Am. Med. Ass. 121 : p. 1158.
30. Hermann and Berman (1942.) Ibid. 120. p. 827.
31. Wilbed and Camp (1946. Nov.) Gastroenterology, Baltimore 1. p. 535.

The symptoms in short are :—

(1) Swelling of the meatus.

(2) Purulent discharge.

(3) Painful and somewhat slow urination is due to irritation by the acid urine of the swollen and sensitive mucous surfaces of the urethra. This pain, during urination reaches its height, by the end of the first week of infection and usually begins to subside after a fort-night.

(4) Chordee or painful erections, are more common at night. It may be an extremely painful condition and not uncommonly difficult to control.

Acute Posterior urethritis. This spread to the posterior urethra commonly appears to take place, between *seventh* to the *fourteenth* day of infection.

Symptoms referable to acute inflammation of the neck of the bladder.

(1) *Frequency and urgency of urination* are imperative and once there is a call the patient must urinate, because he cannot check it.

(2) *Painful urination.* Quite unlike the pain in involvement of the anterior urethra only, it may be referred to the perineum, rectum, hypo-gastrium, or the anterior urethra. It is most acutely felt during the terminal part of the act.

(3) *Terminal haematuria* may result from spasm at the end of micturition. During the effort to expel the last few drops of the urine the pain is maximum. The quantity of blood passed is usually scanty.

Two Glass Test. This is a very rough and ready,[1] but important test, to determine the range of infection in the the urethra.

Chronic Stage. Generally this stage is reached by the end of the third month. The time limit is agreed by common consent.

Chronic anterior urethritis gives rise to he following :—

(1) Urethral discharge. (2) Tendency towards acute exacerbations. (3) Pain, itching or burning in the urethra. (4) Stricture and so on.

Chronic Posterior urethritis shows mainly. (1) Urinary symptoms like urethral discharge, disturbance and mechanical obstruction to urination. (2) Reflex pains and abnor-

1. Frankl, (1937). Dermatol. Woch. 104 : p. 124.

mal sensations. (3) Sexual disturbance like, spermatorrhoea and so on.

Likely Complications of :—

Acute Anterior Urethritis. (a) Abscess of the urethral glands, (b) Inflammation of the erectile tissue, (c) Adenitis. etc.

Metastatic bacterial lesion. (a) Arthritis[2], (b) Endocarditis, (c) Iritis, (d) Bursitis, Tenosynovitis, (e) Periostitis, osteitis, (f) Myositis, (g) Rarely meningitis etc.

The patient should also be examined as a whole to exclude the possibility of any other systemic disease.

TREATMENT

Prophylactic—After exposure next to thorough washing with soap and water and subsequent soaking of the penis in weak condys lotion, oral administration of sulphadiazine has prophylactic value, for details see page 30. Women should take a warm vaginal douche of permanganate solution after clean wash with soap and water and take sulphadiazine orally. Prepuce and other parts should receive special care in this cleansing wash. Urine should be passed after this wash.

Others—living in the risk of close contact with a case having acute discharge should be careful because the pus contains a lot of gonococci which can infect conjunctivae etc. when coming in contact with. Innocent infection of children is a real danger.

Curative. Though penicillin injection is the best and most effective treatment of gonorrhoea, at its various stages, and most readily amenable at its acute phage, yet in out of way places and due to its simplicity and cheapness sulphadiazine treatment in adequate doses should be tried first in all cases. The result of sulphadrug therapy is also very good for the details see page 30. Penicillin is of special use in sulpharesistant gonorrhoea. For the details of penicillin therapy page 55 etc. should be seen. The results of sulphadiazine and penicillin therapy are so encouraging that the older methods and remedies have naturally fallen into disuse, because of their partial usefulness. Irrigations appear useless if not harmful.

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2. Warren and others, (1936). Jour. of Lab. and Clin. Med. 12 : p. 44.

Cure.—After proper treatment discharge if present should not only be seen under the microscope but also, cutural and complement fixation tests need be done. But once penicillin treatment is started for any infection as well as for gonorrhoea, it should be carried out properly otherwise once, a penicillin resistant organism, due to careless or improper treatment is produced there is a real risk for the public as well as for the patient himself. This remark should prompt us to carry out penicillin therapy to a conclusive end with proper dosage and frequency. In some cases the discharge need be examined after massage of the prostate per rectum.

Complications of gonorrhoea also yeild very easily to sulphadiazine and penicillin therapy, and also their incidence have been much lesser than in pre-sulphonamide and pre-penicillin days. But some are mentioned below.

Balanitis occurs specially if treatment has been delayed, the patient having a long prepuce neglecting cleansing etc. It reponds to frequent bath in a concentrated sterile cool magsulph solution. After the swelling is better and if possible the prepuce should be retracted washed and bathed. Simultaneous systemic treatment should continue. The question of circum-cision need be considered.

Periurethral abscess—should be aspirated and one c.c. 500 units of penicillin instilled locally, twice daily, a ten per cent suspension of sulphathiazole in glycerine may also be instilled into these abscess cavities; penicillin injections are also required systemically as for the treatment of gonorrhoea, for details see page 55, etc.

Prostatitis and Seminal Vesiculitis—besides systemic injections of penicillin, in these very painful conditions, warm rectal enema, morphine suppository containing ¼ gr. morphine and 1/60 gr. of atropine may have to be given rectally every 4 to 6 hourly. In the sub-acute or chronic stages digital massage of prostate per rectum twice weekly may be suitable.

In females—also penicillin and sulphadiazine therapy has done away with most complications. For *touching the* cervix, a ten per cent solution of argyrol, or one per cent solution of flavin in glycerine, or a dusting powder containing one dram of Zinc oxide, two drams each of bismuth subgallate and Magcarb levis to make upto one ounce

with starch powder is suitable. *Salpingitis in the female* require almost similar lines of management as in prostatitis and seminal vesiculitis in the male.

Vulvo-vaginitis in children—require systemic as well as local treatment by penicillin and sulphonamides. Local alkaline douches; compresses, local penicillin irrigation are also useful. Several courses of specific therapy may be needed.

Ophthalmianeonatorum—local application of 1 in 1000 penicillin with systemic injection of ten thousand units three hourly of penicillin cures.

COMPLICATIONS DUE TO METASTATIC BACTERIAL LESIONS :—

Endocarditis. This is often difficult to diagnose. About seventy per cent of cases of endocarditis show involvement of the left side of the heart. It is to be suspected in cases of septicaemia by ganococci or where arthritis or a recent instrumentally investigated urethritis is present. Suspicious findings are, persistently quick pulse rate, leukocytosis. A positive blood cultural result is diagnostic.

Sepsis. Not uncommonly the signs and symptoms resemble those of enteric fever. For a proper diagnosis blood culture and complement fixation test may be essential. Clinically, a history of an attack of gonorrhoea, irregular fever, leukocytosis instead of leukopenia commonly found in enteric cases, occasionally perspiration, rigor, and suspicious findings in the heart when endocarditis is associated, may suggest the diagnosis.

Treatment. Rest in bed, on a fluid diet consisting of fruit juice, milk and its preparations, adequate amounts of all the vitamins specially A, C and D, careful regulation of the bowels, and so on are important measures. Penicillin injections cure these cases.

Arthritis. The commonly affected joints are knee, ankle, wrist, shoulder, hip, and small bones of the hands and feet. These are mentioned more or less in order of their frequenry of affection. It is said that if the temporomandibular joint is affected, almost surely the case is one of gonococcal origin.

Treatment. During the acute stage, rest, warmth, immobility of the parts, are essential. Sulphanilamide, and penicillin injections cure.

CHAPTER XXXX

SYPHILIS

Diagnosis.

Clinically, one can diagnose cases of syphilis, provided all the manifestations and their significance are remembered. "Important as are the modern laboratory aids to the diagnosis of syphilis, these should not be permitted to supplant the careful study of the patient himself, for such laboratory aids are by no means infallible and clinical signs of syphilis are still, and probably will always remain of equal or greater importance in its diagnosis[1]"

Primary Stage.

The *primary sore* or the Hunterian chancre usually appears, though in three weeks, yet cases of infection within ten days of the exposure are recorded. Locally it is painless and not tender on pressure. Itching may be present or absent. First appearing as a papule the sore gradually becomes brownish red, firm to the touch, turns as a rule into a button-like nodule with a shallow concave depression on the surface. The size though variable, is usually about one centimeter in diameter, oval or round in outline, with a rather hard indurated margin, hence termed hard-sore. Extreme mobility is one of its characteristics. The surface of the sore may be clear, or grayish or covered by diphtheroid membranes. The secretion is scanty and thin. It seldom suppurates, and rarely bleeds. Though the typical primary sore is single yet in one-fourth of the cases it is multiple. Fournier reported a case with twenty-six simultaneous primary lesions. But the dictum of Ricord which was strongly supported by Fournier "Syphilis always commences with a chancre; there is no syphilis without chancre,"[2] is not supported by modern experience, because genuine cases of syphilis are found without an apparent sore.

Lymphadenitis. The regional lymph glands specially those draining the dorsum of the penis enlarge and feel shotty, not infrequently secondary infection of the chancre leads to buboes. In short the glands are discrete, hard not

1. Osler's Modern Medicine, (1925). Vol. II, Syphilis, p. 437.
2. Leonard, (1935). Jour. Med. deBordeuex, 112: p. 433.

tender on pressure and seldom suppurate. In rare cases those at the groin may not show any appreciable enlargement.

So in the *primary stage* the clinical data helping diagnosis are history of exposure, if admitted, after incubation period, the appearance, colour, indolent nature of the primary sore, hardness of its margins, surroundings infiltrated, comparative painlessness, mobility, little tendency to bleed, gradual enlargement and shotty feel of the groin glands and so on.

Microscopically. The typical spirochaetes seen under dark-field illumination, in the clear serum oozing out from the sore, after it is cleansed, are diagnostic.

Secondary stage.

The organisms get *generalised mostly through the lymphatic* system, and the lymph glands enlarge all over the body. *Rashes* appear in about three to four weeks after the appearance of the sore. They may be of any conceivable type such as macular, papular, pustular, morbilliform, serpiginous and so on. The rash first appears, usually on the sides of the trunk. Generally there is associated some constitutional symptoms like headache worse in the evening, weakness, loss of strength, anxiety state, fever, adenitis and others. Syphilophobia may dominate the clinical picture in some cases. Some of the cutaneous and mucous lesions are characteristic and constant manifestations of secondary syphilis. Ulcerated syphilides, condyloma, snail track ulcers in the palate or buccal mucosa, alopecia, pigmented syphilides, mucous patches are highly suggestive. Late secondaries like iritis, tongue changes, may be helpful manifestations in the diagnosis.

Tertiary Stage. Though there are certain favourite sites, to be picked up at the later stages, yet no organ or structure of the body is immune from the effects of this disease. Any indolent swelling[3] which takes some time to break down from its centre and is unduly slow to heal up, any slowly healing suspicious ulcer having a brown, may be, sclerosed margin, should lead to further search and the Wassermann reaction of the blood tested. The commoner sites for nodular granulomata are iliac crests shoulder blades, palms of the hands, nose, forehead, flexor surfaces of joints and other places.

3. Jour. Amer. Med. Assoc., (1937). 108: p. 2254.

Amongst bones, the sterno-clavicular joint is liable to be affected most, notably in acquired syphilis. Tebia, sternum, and other bony parts exposed to injury, or blows are more likely to show these manifestations. Gummata in the liver may show umbilicated nodular swellings or scars on that organ, but the nutrition of the patient may be fair or even good, seldom showing ascites or jaundice Therapeutic test by the administration of potassium iodide and others, serological test (W.R.) may clinch the clinical diagnosis.

Some suggestive manifestations.

These are, aortic incompetence, without involvement of the mitral valve and no history of rheumatic fever, cardiac pain, dilatation of the heart or the aorta without any apparent cause,slow growing swelling[4] any where which is difficult to cure by average treatment, thrombosis of the cerebral vessels in adults or persons of middle age or older, any gummata, ulcers very slow to heal. Suspicious growths on the tongue, should not only lead to further clinical examination but also the specific serological and subsequent proper therapeutic tests applied.

A few points on the diagnosis of Congenital Syphilis.[5]

History of repeated miscarriage in the mother, at first, during the early months and later as the effect of the disease wanes away, still-birth, hydramnios and so on are suggestive. Later on a living but "little old man" like child, subsequently to be a victim of one of the various types of rashes, asymmetry of the skull, large frontal bosses, flattened nose, vaulted high arched palate, rarely microcephaly may point to the diagnosis. Developmental defects like partially developed heart valves, testes, breast, ovaries, congenital hernia may not be rare. The commoner characteristics namely "Hutchinson's triad"[6] consisting of the typical appearance (Trousseau) of the child consists of a yellow skin, scanty hair, or a bald head, absent eye lashes. But the well-known "little old man" may not be typically present.

Snuffles etc. Snuffle is the coryza resulting from sphilitic granuloma of the nasal mucosa. There may be

4. Black, (1937). Brit. Med. Jour. i: p. 1313.
5. Nixon, (1934). Clinical Journal. 63: p. 397.
6. Klauder and Robertson, (1934). Jour. Amer. Med. Assoc. 103: p. 236.

ethmoiditis and similar other changes. The serous discharge, sometimes contains blood, bits of necrosed tissue may come out. Nutritional disturbances, fissures at the angle of the mouth, rhagades and so on are not uncommon. Development of interstitial keratitis several years after birth may be an important evidence of congenital syphilis.

Laboratory aids to diagnosis.

(1) The finding of the spirochaetes is diagnostic.

(2) The Wassermann reaction[7] when found positive coupled with suspicious clinical findings, have diagnostic value. But rarely positive or doubtful serological reactions are got during active infection caused by malignant tertain malaria, yaws, leprosy, relapsing fever, diabetes mellitus and lobar pneumonia. There are numerous other such as Kahn's[8,9] test, test of Noguchi and so on. But the Wassermann and the Kahn's are the main standard tests found positive in syphilitic infection.

TREATMENT

PROPHYLAXIS.

Syphilis is one of the most wide-spread of venereal diseases, and, such very effective preventive measures like, regular medical examination of public women, improving the pay of women of the working class, education of the public, segregation of the infected, and so on, which are done in more advanced countries are naturally beyond the scope of the present work. Continence for the individuals should really be the main-stay in keeping off the risks, though this is not always practicable for every one.

Congenital transmission is best prevented by timely and thorough treatment of the parents. It is gratifying to find that adequate treatment of the mother, notably before conception and also during pregnancy produces perfectly healthy babies. See also penicillin in syphilis for details.

Prophylactic mercurial inunction. There is experimental evidence in support of the fact, that shortly after exposure, if an ointment like the following is anointed well, the infection may be prevented. But still better would be

7. Hazen, Sanford, Paran and others, (1936). Ven. Dis. Inform, 17 : p. 253.
8. Davies, (1937). Ibid. 18 : p. 187
9. Cluver, (1937). Brit. Med. Jour. i : p. 1120.

to steep the parts in one in two thousand solution of hydrarg-perchloride, for a few minutes, then rub and smear well the undermentioned ointment on the parts.

Hydrarg Subchloride	gr. 180
Lanolin	gr. 240
White Vaseline	upto oz. 1

Accidental or innocent infection. This should be carefully avoided by preventing contact with actively infected persons, in the stage of systemic spirochetaemia.

CURATIVE TREATMENT.

Preliminary systemic examination. Before actually starting treatment the patient should be examined thoroughly and carefully, and his urine and blood fully investigated. This is important in view of the fact that as the treatment has got to be pretty long in duration, if the dictates of science are to be followed, so the importance in beginning on a system about which some details at least are known. An already damaged kidney or heart means cautious therapeutic regime and these can only be found out by careful physical examination of the patient before the treatment is begun.

Excision of the ulcer. Almost simultaneously with the appearance of the primary sore the spirochaetes have crept up the lymphatics to the regional glands, so that excision of the chancre has practically been abandoned.

But one should not forget that a thorough treatment during this stage affords the greatest chance of a complete cure.

Locally. The parts should be kept clean by dusting a powder containing equal parts of calomel and bismuth oxide. Lotio niagra used locally may limit the spread of the sore

Chemo-therapeutic ratio of anti-syphilitic drugs[10]. Before actually undertaking treatment one should better remember the relation between the maximum tolerated dose of a drug to the minimum effective dose, this is called chemo-therapeutic ratio. For *organic* arsenical remedies this varies between twenty and thirty to one. Probably there is still greater margin of safety with the new organic arsenical arsenoxide called mapharside. *In mercurial drugs* it is almost two to one and this is why treatment

10 Cole. (1936). Jour. Amer. Med. Assoc., Dec. 26th; p. 2124.

by mercurial preparations may easily lead to poisoning symptoms. Whereas with *bismuth* the range is quite wide namely fifty to one. So, naturally the safest anti-syphilitic is bismuth, next comes organic arsenicals, lastly the mercurials with very narrow margin between the effective and the tolerated therapeutic dose of the remedy. Penicillin appears almost harmless, and practically nontoxic.

Relapse inspite of treatment. During the first one year and a half of infection, syphilis has a tendency to relapse inspite of moderate treatment, this is all the more reason why a more or less continuous intensive course of medication for seventy weeks, is recommended by the American workers.[11]

Penicillin in Syphilis.

All forms of syphilis appear to be favourably influenced by penicillin specially when in combination with organic arsenicals or bismuth[12] injections. The present tendency is to give bigger doses 20 to 40 thousand units three hourly intramuscularly for seven to ten days. Herxheimer reaction usually seen during the first 24 hours of treatment may indicate temporary smaller doses till the reaction is over in 24 to 48 hours time. For details also see page 58 and onwards. To know how penicillin and arsenicals act in syphilis one should read the paper by Frazier and Frieden[13] (1946).

Penicillin in syphilis with pregnancy,[14] congenital cases etc.

Recently Ingraham and coworkers[15] (1946) have shown that syphilis with pregnancy, though mostly early cases of the disease, produced normal babies after proper penicillin therapy, given during the latter part of gestation. The dose employed was 20 to 50 thousand units intramuscularly three hourly for 7 to 9 days. Goodwin and Moore's[16] obser-

11. Stokes and others, (1934). Jour. Amer. Med. Assoc. 21st April. p. 1261.
12. Schoch and Alexander (1946. March 16) Jour. Am. Med. Ass. 130. p-696.
13. Frazier and Frieden (1946. March. 16) Jour. Am. Med. Ass. 130. p-677.
14 Lentz. Ingraham et al (1944. Oct. 14) Ibid. 126 : p. 408.
15. Ingraham, Stokes et al (1946. March. 16) Ibid. 130 p. 683.
16. Goodwin and Moore (1946. March. 16) Ibid. 130. p-688.

vation in 57 pregnancies with syphilis affords similar results. *Congenital syphilitic infants*[13] appear to have been favourably affected by 20 thousand unit doses of penicillin intramuscularly three hourly for *ten to fifteen days* instead of the usual 7 and a half days of therapy. In debilitated under weight, feeble children treatment should accompany maximum supportive and general pediatric care. Though the dose of penicillin advocated for children has been 10 thousand units per pound but larger doses have been used, probably with greater therapeutic efficacy [17]

Organic Arsenicals. These preparations of the arsenobenzol group are very effective and often striking in their amelioration of signs and symptoms of this disease. But to depend exclusively on them for a thorough cure appears some-what unsafe as cases so treated at the early stage of the disease have come with aneurysm and other late manifestations caused undoubtedly by syphilis.

The commonly used preparations are neosalvarsan, novarsenobillon, sulphostab, sulfarsenol, mapharside, and numerous others. These powders are dissolved in five to ten c.cm. of redistilled water, and injected without any unnecessary delay into the median basalic vein preferably of the left arm. Care should always be taken to see that the needle is inside the vein, as indicated by the inflow of blood during a gentle withdrawal of the piston, while the rubber band, making the vein prominent is still kept tied on. Once the needle is definitely in the vein the rubber band is relaxed and the contents of the syringe pushed into the vein gently and cautiously, watching for any possible untoward symptom. The contents of any cracked or broken ampoule are always to be discarded and condemned.

Recent Ideas :—Syphilis requires steady and systematic treatment for a prolonged period without irregularity; a combined bismuth arsenical therapy is much better than either alone. *Now we have got another potent remedy in penicillin.* Though the American workers advocate a continuous period of treatment as represented in their formula—"30-60-03"[18] meaning thirty weekly injections of arsenicals preferably arsenoxide, and sixty representing sixty injections of bismuth subsalicylate o denoting no rest

17. Ingraham, Stokes et al (1946. March. 16) Ibid. 130. p. 694.
18. Stokes, (1938) Jour. Connecticut. State Med. 2: p. 172.

period and 3 representing three years treatment and observation is quite a continuous therapy[19]. For more resistant cases they advocate "40-80-04" thus the patient receiving 10 more of arsenicals and 20 more of bismuth and 4 years of treatment and observation without rest period. This appears too drastic for average Indian, where the English and Scandinavian system[20] will be suitable. More over we in the tropics suffer sometimes, if not frequently, from high rise of temperature due to malaria and other infections, and such pyrexia seem to influence the course of syphilis favourably and may be one of the causes why general paralysis of insane and some other serious neurological complications are not so common in this part of the world.

Dosage etc.—Intensive treatment[21] consisting of continuous intravenous drip[22] of arsenicals for 5 to 10[23] days is certainly risky[24] specially in Indian private practice and these have been given up by English and Scandinavian workers for the more reasonable 8 weekly injections of arsenicals, concurrently with ten intramuscular injections of bismuth. Mercury may be used in place of bismuth, but the latter has a wider chemotherapeutic ratio hence, the least chances of poisoning. Cases becoming seronegative after the first course should receive four more such courses with an interval of 3 to 5 weeks, between each. Cases remaining seropositive after this course should receive at least three more such courses after the one making serum reaction negative. Women should get the same course only in smaller dosage according to body weight. Probably the more resistant New world spirochaetae require the intensive treatment advocated by the American workers. In our experience we find the English system quite adequate.

Dosage frequency method of administration etc.

Some careful observers suggest that the first four doses of these remedies should not exceed 0.3 g, because most cases of poisoning or sensitiveness occur during these early injections and if the dosage is larger, the untoward results

19. Stokes (1942) Jour. Am. Med. Assc. 120 p. 1093.
20. Jour. Am. Med. Assc. (1935) 104 p. 1329.
21. Sadusk (1944) New Eng. Jour Med. 230 p. 314.
22. Thomas, Wexler et al (1943) Jour. Am. Med. Assc. 122 p. 807
23. Rattner (1943) Ibid 122 p. 986.
24. Stokes, Beerman et al (1943) Am. Jour. Med. Sci. 206 p. 521.

become graver than when smaller doses are used, hence the caution. Toxic symptoms are least with arsenoxide group.

The average subsequent doses for women and thin persons is 0.3 to 0.6 g. and for men 0.4 to 0.75 g. *Usually one injection is given per week till about four to six grams in women and thin persons, and about six to seven grams in men are reached in total.* As in the treatment of Kala-azar, so also here, it is the total amount of drug in grams and for the number of injections which is the important point to be taken into account. *Better results are obtained when these injections are alternated with intramuscular injections of some preparation of bismuth, than when these arsenobenzol group of drugs are given alone.* Any one of them is undependable, the combination is better.

Intramuscular injections. Medicines given intravenously are more quickly excreted than when they are given intramuscularly. Most workers agree that intramuscular injection of sulfarsenol gives more lasting effect than when it is given per vein. Personally I prefer intramuscular route of injection to the intravenous medication. *It is more effective but less risky.* Sulfarsenol is very suitably given into the muscles of the buttock.

Mapharside (P. D.) or Neohalarsine (M. B.). This is a very recently introduced organic arsenical having the chemical name "meta-amino-para hydroxy phenylarsine oxide" called arsenoxide in short. Peterton (1937)[25] gave eighteen hundred injections in 99 patients and says that a full dose 0.06 g.[26] will sterilise a surface lesion of syphilis in *twenty-four hours. He considers mapharside to be a distinct improvement over both old and new arsphenamine group of drugs. Over the old arsphenamines mapharside was found to have the following advantages*:—(a) A lower arsenical content; the average dosage being about one-tenth that of the old arsphenamines. (b) Exfoliative dermatitis and damage to the liver and kidneys are practically unknown. (c) Less of disagreeable taste and smell (d) Better toleration. (e) Less of local discomfort even if the solution extravasates into the tissues. *Arsenoxide group are the best arsenicals and should be more extensively used.* Unless very carelessly given they are practically non-toxic.

The untoward symptoms like nitritoid crises, and severe reactions following other arsphenamines are rare after

25. Canad. Med. Assoc. Jour. (1937), 36; p. 172.
26. Wieder and coworkers, (1937), Arch. of Dermatal and Syph 15: p. 402.

its use. Gastro-intestinal disturbances are however not very uncommon.

How to use it. The patient should not take any heavy meals three hours before and two hours following the injections. This drug is always to be dissolved at least in ten c.cm. of redistilled water, about one and a half c.cm. of it are pushed into the ampoule of mapharside whose neck is already broken, there is effervescence, as soon as the solution looks clear, it is drawn into the syringe with an air bubble; the solution is shaken several times so that any of the gas (CO_2) to be formed mixes with the air, after the latter has been expelled, the clear solution is ready for injection. While injecting the most important point is to push the whole ten c.cm. of the solution into the vein in thirty seconds or quicker. The patient should be instructed to raise up his injected hand, and preferably the veins are emptied by massaging from periphery towards the heart, so that any traces of irritant solution remaining in the vein may not produce pain along its course. If slowly injected, the vein becomes painful.

Dosage, plan of treatment etc. The doses in which it is supplied are 0.04, 0.06 gram. The initial one should always be 0.04 g, and the maximum one better remain 0.04 g. for women and 0.06 g. for men. The plan of treatment should be as suggested by the English and Scandinavian group of workers.

The second method.[27] This method consists of one injection each of mapharside and bismuth per week, for fifteen weeks. Two weeks rest, then the above course is repeated, again three weeks rest followed by another course. This makes a total of forty-five injections each of bismuth and marpharside.

Precautions before injection of these arsphenamines.

While actually giving these preparations, notably intravenously, one should not exceed 0.3 g. of the neoarsphenamine group and 0.04 g. of mapharside. First four doses of intravenous medication should always be limited to the above dosage.

As a precautionary measure one may give a powder like the following one to be taken thrice daily, the day preceeding, on the day and the day following the injection of these arsenicals.

27. Parsons, (1937), U.S. Naval Med. Bull 36 : p. 207.

Calcium gluconate or lactate	gr.	10
Sodium bicarbonate	gr.	20
Glucose upto	gr.	60

The patient should not take any solid food three hours before and two hours after the injection. He may be allowed to take one glass of glucose or sugar solution with lemon juice one to two hours before the medication. This and the remedies given in above prescription protect the liver from damage.

Contraindications. These remedies are more or less contraindicated in advanced syphilitic meso-aortitis, with or without incompetence, nephritis, cirrhosis of the liver, extreme weakness, low blood pressure, previous eye or ear troubles and any bad skin disease which may get worse following these injections.

Some commoner difficulties in arsenical treatment.[28] Nitritoid crisis shows symptoms of vasomotor atony, like those produced by the administration of amyl nitrite and is best treated by the injection of adrenalin one c.cm., better adrenalin and ephedrine combined. Twenty to thirty drops of spirit ammon aromat in a little water, given five minutes before the injections may prevent it. If the injections are given very slowly this may also be averted.

Jarisch Herxheimer reaction. There is temporary aggravation of the symptoms and signs shortly after the injection, notably those of the cutaneous system. This tends to pass off in a few days without any treatment. The reaction like vaccine may be local focal and general.

Skin rashes and dermatitis. These may vary from simple or evanescent mild rashes to the most severe exfoliative dermatitis.

Treatment of rashes following arsenicals. Intravenous injection of half to one gram of sodium better calcium thiosulphate in ten to twenty c.cm. of concentrated glucose solution twice daily for the first three to six days, subsequently, once a day, and less frequently later on, helps by promoting excretion and neutralising the heavy metals in the system. Plenty of fluid orally may be useful also by helping excretion. Purgative like magnesium sulphate also act in the same way. Potassium iodide in three to five grains is recommended by some. Contramine 0.25 g. intramuscularly every third to fifth day may be of use. Local applica-

28. Orr, (1935). Canad. Med. Assoe. Jour. 32; January, p. 19.

cation of lotio calamine, olive oil, better sterile codliver oil, is soothing. These oils may suitably be applied on lints soaked in them.

Jaundice. It may be present as a symptom of syphilis, but bigger doses of the neo-arsphenamine may precipitate jaundice causing damage to the liver. This latter type of jaundice generally appears in about two to four months after the course of arsphenamine treatment, and hence their correlative significance is often overlooked. Infective hepatitis contraindicates arsenotherapy.

Treatment of Poisoning. Treatment consists in promotion of excretion injections of contramine and thiosulphate as in cases of dermatitis. Plenty of milk-casein is useful.

The *itching* may be relieved by local application of lotio calamine, alkaline carbolic acid solution and so on. Injection of atropine in 1/100 gr. may also relieve it. Rarely there may develop blood dyscrasia and haemorrhagic tendencies, following a course of arsenical remedies, hence the blood should always be examined with that point in view. Injections of *extract of liver is of service*[29] If there is any tendency towards agranulocytosis, intramuscular injections of the best agents to stimulate leukocytosis such as pent-nucleotide and pyridoxine may be of value. Decholin solution in five to ten c.cm. intravenously with glucose daily for three, four days per week may do good.

Haemorrhagic encephalitis. It is a very serious complication and generally appears two to five days after the second injection of neoarsphenamine group. The bigger this dose the worse is likely to be the manifestation. The symptoms are pain in the head, vomiting, convulsions, unconsciousness, coma, and so on. Rigidly of neck may or may not be there. In autopsy, extensive haemorrhages are found in various parts of the brain.

This condition may, to some extent, be avoided by the injection of four smaller initial doses of neoarsphenamine remedies. Treatment consists in injections of thiosulphates and contramine, calcium, alkalies, glucose, either orally or by injection. Lumber puncture, if there is rigidity of the neck or positive Kernig's sign, may do good It should be repeated whenever there is indication.

Bismuth. The chemotherapeutic ratio of this metal is fifty to one, hence it is rapidly replacing mercury in the

29. Chatterjee, (1937). Lecture on Arsenoporitran. 24th May, 1937. (In the Ind. Med. Assoc. Hall).

treatment of syphilis. Being less toxic it does not produce anaemia and irritation of the kidneys, as are done by the mercurial remedies. It is of particular use in cases where mercury is contraindicated. Bismuth should never be given intravenously because it may cause death[30] even.

Hanzlik (1929 and 1937)[31] advocates, ten intramuscular injections of two c.cm. each of a one and a half per cent. solution of *sodium bismuth tartrate*. These injections are given twice a week. Potassium iodide is to be given orally in big doses during the whole course of this treatment. It is favourably reported by the American workers, for the treatment of cardio-vascular syphilis, where organic arsenicals are more or less contraindicated. The kation in the Iodobismuthate of quinine is said to have a greater penetrating power in to the nervous system[32], hence is of special use in the treatment of neuro-syphilis, coupled with big doses of potassium iodide orally. It is a red coloured thick liquid which has got to be warmed up in a bath in order to make it suitable to be drawn into the syringe.[33] They are given in two to three c.cm. doses intramuscularly into the upper and outer quadrant of the buttock once or twice a week. Bisquinol, iodobismuthate of quinine besides numerous others are two of the important preparations of this type.

The recent tendency is to use a *suspension of metallic bismuth powder* in five per cent. glucose solution. The dose is generally two to three c.cm. intramuscularly into the gluteus muscle, once a week or half the above dose twice a week. The amount of metal given varies between 0.3 to 0.4 g. or about four to six grains per dose, per week. A total amount of three to four grams of the metal should be spread over three months Because if given more frequently or in shorter period of time there appear symptoms of poisoning by bismuth.

Effects of bismuth therapy. Its therapeutic value is more lasting but less rapidly efficacious than that of neoarsphenamine group, it is better than mercury. "Neoarsphenamine is more effective and rapid in action in primary

30. Curtis, (1930). Jour. Amer. Med. Assoc. 95 : p. 1588-70.
31. Hanzlik, (1937), Amer. Jour. Syph. Gonorr. ond Ven. Dis. 13 : p. 1.
32. Jour. Amer. Med. Assoc., (1936). 1st Feb. p. 382. New and non-official remedies.
33. Thurmon, (1936). New Eng. Jour. Med. 215 : p. 215.

syphilis, while in secondary syphilis bismuth and arsenic are about equally valuable; in tertiary syphilis and neuro syphilis, bismuth is superior to arsenic and mercury, and it is also valuable when spirochaetes have developed tolerance to these."[34] Under bismuth therapy alone spirochaete disappear from the primary or secondary lesions after two injections. Whereas the gummata retrogress after three or four injections. If bismuth is combined with arsenicals, the risk of incidence of neuro syphilis decreases. In the treatment of nervous syphilis this combination is the best. Bismostab and hypoloid bismuth metal are two of the many good preparations of metallic bismuth.

Dosage and frequency. For adults two c.cm. once a week, ten such or twenty injections of one c.cm. each, twice a week. For children, over eight years half, four to eight years one third, one to four years one-fourth of a c.cm. per injection. The total dosage should be according to the body weight. The therapeutic value of these preparations depend on total grams of the metal and not on the number of injections. Three to four grams of the metal constitute one course. The next course of injections of bismuth should not be repeated before an interval period of two to three months, as the metal is very slowly excreted. There are some workers who are against the use of bismuth because even weeks after these injections skiagram shows deposits of the metal in the muscles. But this need not be a defect of this therapy as already pointed out, it is slow but some what sure in action. But "it cannot be relied on as the sole antisyphilitic drug to the exclusion of the arsphenamines."[35]

Over dose and toxicity. Regular periodic examination of the urine is essential, because stomatitis and albuminuria are not uncommon early signs of mild toxicity Blue line in the gums, rashes, tremor etc., are not uncommon. Any symptoms of poisoning indicate complete cessation of bismuth therapy.

MERCURY.

This was the main stay of the old doctors in the treatment of syphilis. Its chemotherapeutic ratio is about two to one hence the margin of safety in treatment by this drug

34. Bruce and Dillings' Materia Medica and therapeutics, (1933). 14th Edition, p. 168. Cassel and Co.
35. Walsh and Becker (1941) J. A. M. Asso. Feb. 8th p. 484. 116.

is naturally very narrow. This is the reason why one should watch carefully for symptoms of poisoning while treating a patient by mercurial derivatives. It is exhibited by injection, inunction, fumigation and oral routes. But it is being fast replaced by metallic bismuth and its preparations.

Intramuscular injection. Oily suspension of calomal in one grain doses with camhpor and creosote to lessen pain, given intramuscularly, into the buttocks, once a week, till six to ten such are given, was in vogue before.

Intravenous. Oxycyanide of mercury (Hydrargyrum oxycyanidum) in one-sixth of a grain, in about five c.cm. of normal saline, given slowly per vein once a week, was advocated, but it also may produce symptoms of poisoning in the susceptibles.

Inunction. About one dram of unguentum hydrargyrum or unguentum hydrarg oleatis should be rubbed daily on the hairless parts of the body for half an hour. The best sites are the pectoralis muscles and the sides of the chest, flanks, the hairless inner side of the high, each for one day, six days in the week. All these sites daily one after the other are utilised for inunction. The seventh day, preferably Sunday morning, the patient should take an effective dose of saline purgative and a warm bath, no inunction being given on that day. This cycle is to be repeated till a full course of forty to sixty inunctions are given. After each eighteen such, a period of three to seven days rest is preferably advocated.

A suitable method of treating *congenital syphilis* is by smearing over a flannel binder one of the ointments mentioned above and the child's abdomen wrapped round with this,. It is to be kept for twelve to eighteen hours and is repeated as required. Unguentum hydrargyrum has been found to be more uniformly and easily absorbed than the oleate or the calomel ointment. Inunctions though quite effective, are messy and there is risk of some cumulative action as in all mercurial remedies.

Oral administration. The following mixture may be taken with hot milk to prevent iodism, twice daily after food for five to six days in a week, by an adult, with, one to two days' period of rest per week. After three weeks' course a week's rest should be given. Then again the whole course is to be repeated once or twice according to reaction, presence or not of mercurialism and so on.

Potassium iodide gr. 10 to 30
Liquor hydrarg perchlor m. 60
Tincture card co m. 10
Orange Syrup m. 60
Peppermint water upto fl. oz. 1

Iodides may be given in five grains to start with, to be increased gradually. For children the dose may have to be modified according to age, body weight, and so on.

Hutchinson's Pills.

Hydrarg cum crete
Pulv ipecac Co. (Dover's powder) aa gr. 1
Extract gentian upto gr. 5

one pill three to four times a day, after some food, six days in the week. To prevent the colitis and consequent diarrhoea caused by hydrarg, the corrective, namely pulv ipecac co. is added. One course consists of a month to six weeks treatment. The complete period should consist of two to three such courses, with ten to fifteen days rest after each one. The main difficulty in oral medication is the variability in absorption of the drug according to the power of assimilation of the individual.

Fumigation. This method has now become more or less obsolete.

Precautionary measures to be taken before giving hydrarg. As there is some risk for the teeth and gum under hydrarg medication, care should always be taken to keep them clean by regular use of a hard brush and good tooth paste. A gargle several times a day of two drams of potassium chlorate to eight ounces of distilled water may prove useful. Caries in the teeth should be filled up. With appearance of the early symptoms of poisoning the drug should be stopped.

Symptoms of mercurialism. The symptoms of acute poisoning are severe colitis, with swelling of the gum margins, salivation, loss of appetite, dysentery like symptoms and so on. In *chronic poisoning* which is more common, there is metallic taste in the mouth, increase of salivery secretion which becomes thick and ropy. There may be fetor present in the breath. The gums may be swollen and spongy, the salivary glands also share this swelling. Loss of appetite, diarrhoea may appear.

Treatment of mercurialism. Further medication should be stopped. Injections of sodium better calcium thiosulphate and contramine as given in poisoning by neoarsphenamine group are of service. Potassium chlorate orally

in two or four grains, thrice daily may be useful. Frequent gargling of a hot solution containing equal proportion of saturated solution of alum and potassium chlorate may be helpful. Painting the gum margins with a concentrated solution of tannic acid may be of relief. Injection of atropine sulphate in one hundredth of a grain or tincture belladonna is seven to twelve minims twice daily is advocated. Hot bath with proper massaging of the body may be comfortable. Adequacy of the vitamins, notably A, B and C may hasten recovery. The anaemia and debility may have to be treated by big doses of iron after food. Tonic, good food and medicines by improving appetite and digestion may be of value. It should be noted that it is good systemic resistance, on which we have to depend to overcome, all diseased processes, hence no pains should be spared to raise the defensive power of the system. Exhibition of iron in big doses, injections of liver extract may do good during the period of intermission between courses of mercury. In serious anaemic cases transfusion of compatible blood may save him.

Iodides. This is usually given in the form of potassium iodide in ten to thirty grains, preferably with hot milk thrice daily. When given with warm milk iodism is very uncommon. It should always be exhibited in increasing doses of even half to one dram thrice daily for gummata and in other resistant forms of this disease.

It has no direct action on the spirochaetes, but helps in dissolving the gummata, thus the organisms are laid to be acted upon by the antisyphilitic spirocheticidal drugs. The unsaturated fatty acids near about gummatous tissues prevent the normal lytic juices from acting on them, the iodine from the iodides given orally saturate these unsaturated fatty acids allowing the tryptic juices to act on and dissolve them.[36] This is why potassium iodide appears indispensable in the treatment of syphilis, notably at its later stages.

Snodgrass (1935) tried the effects of iodides of potassium and sodium on 1750 cases. He concludes, as others do, that the spirochaetes are not destroyed by iodides, but help the healing up of syphilitic lesions. Iodism was common in smaller doses. *The taste of the drug is well disguised and iodism was very rare when it was taken with hot milk.*

36. Burke, (1935), Arch. of Dermatol and Syph, 14 : p. 404.

Sodium iodide may be given intravenously in even sixty to ninety grains in a ten per cent solution. When required such medication could be reinforced by oral exhibition of iodides.

Resistant syphilis. The failure of proper response to to treatment, in certain persons, is thought by some workers[37] to be due to lack of response mainly of the reticulo-endothelial system of cells. For these cases, stimulation of the systemic defence by artificial fever therapy is advocated. For this purpose artificial malaria, typhoid vaccine intravenously or other foreign non-specific proteins have been tried. Fourteen cases of interstitial keratitis, besides others, were treated by malarial fever therapy, causing the acute symptoms to disappear from four to eight weeks time.

Pyrogenic Treatment. The effect of mechanically produced pyrexia on early syphilis was studied by Epstein and Cohen[38] (1935). They devised a mechanical arrangement in which the body and the limbs of the patient were enclosed, and the temperature of the air inside was raised to 104°F or more. This temperature was maintained for six or seven hours. The patient was given one hundred and sixty c.cm. of hot lemonade containing 0.6 per cent of sodium chloride every half an hour to replenish fluid and salt lost through perspiration. Sedatives are also given when there is restlessness. The treatment is repeated every three to four days. Out of thirty three cases of early syphilis, all showing spirochaetes in their serum, twenty seven became negative after the third or fourth exposure to heat. The majority, nineteen, became negative by the beginning of the second sitting.

FEVER THERAPY.

Malaria. Many workers including Wagner Von Jauregg (1918-19) Muhlens,[39] (1920) and others [40] have shown that artificial infection of malaria by injecting one to two c.cm. of blood of patients suffering from this protozoal infection (benign tertain preferred) by raising the body temperature, was beneficial to persons suffering from general paralysis of the insane. But it soon became evident that a

37. Dennie and Mc. Bride, (1934), Arch. Dermatol and Syph. 30 : p. 1.
38. Jour. Amer. Med. Assoc., (1935), 104 : March 16 p. 883.
39. Munschen Med. Woch., (1920), July 16th.
40. Paulin, (1936), Ann. d. Mal. Ven. 31 : p. 561,

rise of body temperature up to 104 or more degrees, Farenheit was beneficial to all forms of syphilitic disease. Though some differ[41] from this idea. Diathermy[42] has been found useful by some.

Foreign proteins of various types including milk protein, intravenous typhoid vaccine and other fever producing agents have been found useful too, in all forms of syphilis.

But for actually practising the above methods of therapy one must have experience in these forms of treatment.

Injections of sterile milk, given intramuscularly into the gluteus, produce different grades of febrile reactions according to susceptibility of individuals.

Induction of Malaria in general paralysis of insane and other forms of syphilis, inoculation of one to two c.cm. of blood of a person suffering from or harbouring active benign tertian malarial parasites, has produced satisfactory results in many cases. Usually after an incubation period of four to nine days, the paroxysms of fever start, and the good effect is largely proportional to the height of the temperature secured. The number of paroxysms of fever required to produce satisfactory therapeutic effects, range from two to a dozen or more, and is conditioned a good deal, by the patients' tolerance of the treatment. Once the desired number and grade of pyrexia is attained, quinine therapy in doses of five grs. each thrice daily for a few days cures the malaria. Some prefer, after the convalescence, to administer neoarsphenamine in average cases, and tryparsamide in neurosyphilis.

The results of induced Malarial Pyrexia have been satisfactory in thirty three percent, some improvement in another thirty three percent and none in the rest thirty three percent of cases of general paralysis of insane.

N. B. But there has been a mortality ranging from one to thirty percent in malaria therapy, depending upon the choice of the patients and the experience and caution of the doctor. Such treatment should never be taken up light heartedly, and persons of very weak health extreme anaemia active diabetes, of pulmnary tuberculosis, if quinine sensitive or having cardio-vascular syphilis are usually unsuitable subjects for this therapy.

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41. Beck, (1939), Jour. of Ment. Sci. 82: p. 254.
42. Neymann and Osborne, (1931), Jour. Amer. Med. Assoc. 96: p. 7 to 13.

Typhoid Vaccine. Kunde[43] (1927) and his co-workers have used the intravenous weekly injections of typhoid and para-typhoid group of organisms, the usual initial dose being about two hundred million organisms till by the twelfth dose about four thousand millions are reached. Each dose is increased rapidly from the previous one. But the disavantage is that by this intravenous medication rapid production of immunity against the antigen in the patient prevents further marked reactions to take place in some cases.

Nelson[44] (1933) proposed a method of securing higher temperatures with typhoid vaccine, by giving a second injection at the height of the fever.

Prenatal Syphilis.

Prenatal syphilis gives good opportunities for adequate preventive measures. The possibilities may be discussed profitably under the following headings.

1. Control of the transmission of syphilis in sexual life and cenception.
2. Prevention of conception during the infective period.
3. Treatment of one or both partners, before conception.
4. The treatment of pregnant woman, and through her, of the child in the womb.

We are here concerned mostly with the last question, because the preceding three items, can be adequately dealt with by the lines of treatment chalked out already for early or late forms of syphilis. By thoroughly treating one or both the partners as the case may be, before conception the transmission of syphilis to the child, may be prevented.

TREATMENT OF PREGNANT WOMEN.

Boas and Gammeltoft[45] (1928) in their series of two hundred and one mothers suffering from syphilis, but receiving no treatment 96.5 per cent of the children were syphilitic and 3.5 per cent only healthy. Of the eighty seven syphilitic mothers receiving treatment by mercurials only before pregnancy gave birth to ninety per cent of syphilitic children, ten percent of healthy ones and so on.

While, of the hundred and five mothers receiving arsphenamine during or both before and during pregnancy,

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43. Kunde, Hall, Grety, (1927), Jour. Amer. Med. Assoc. 1627 : 86 : p. 1304.
44. Nelson, (1931), Amer. Jour. Syph. 15. p. 185 to 189.
45. Brit. Jour. Ven. Dis., (1928). 4 : p. 107 to 122,

only from fifteen to twenty percent of the children were syphilitic and eighty five per cent were normal. Penicillin has been very useful here. See under treatment of pregnant women page 353.

But the best results have been obtained by the combined arsphenamine and heavy metal treatment.

Cardiovascular syphilis

Cardio Vascular Syphilis manifests itself usually between fifteen to thirty years after the primary infection.[46] The characteristic lesions are syphilitic meso-aortitis resulting in aortic dilatation or aneurysms. But the more important physical change results in aortic incompetence and stenosis of the coronaries. The big size of the heart, anginal pain, the latter not uncommonly due to the ischaemic cry of the myocardium, are not at all uncommon. Average time of heart failure in a group was 23.1 years from primary infection.[47] Another important diagnostic point in early cardiovascular syphilis is in unusual cardiac enlargement without any demonstrable cause.

Best results are obtained in cardiovascular syphilis, if the treatment is begun early, and the progress of the disease already not too advanced. Because, once the valves of the heart, the mesoderm of the aorta and the lumen or vascular supply of the coronaries are involved in the cicatricial contraction, very little could be expected from treatment.

At least six to twelve weeks rest in bed is essential, specially at the beginning of therapy, when the antisyphilitic remedies are reacting on the damaged tissues.

Arsenicals are generally contraindicated, so also is penicillin as they cause temporary aggravation of the symptoms (Herxheimer reaction) and may even occlude the already partially distorted lumen of the coronaries, resulting not only in worsening of symptoms but also may cause even sudden death. But if the patient can stand, there are improvements in symptoms following injections of organic arsenicals. But generally it is safe to avoid arsenicals at the beginning of treatment of cardiovascular syphilis, for the reasons given above.

46. Belford, (1936), Treatment of Cardio-arotic syphilis, in Treatment in general practice. p. 193. Lewis London.
47. Blackord and Boland, (1932), Jour. Amer. Med. Assoc. 3rd. Dec. 1932. p. 1902.

The principle of treatment is to start with injections of mercurials or bismuth and oral administration of iodides, the patient resting in bed all the while, and all manual work being suspended. This rest should specially be enjoined in cases of aortic imcompetence with cardiac enlargement, because in such cases organic arsenicals if used, may do serious harm by temporarily flaring up the lesions.

For the details of use of mercury see the previous pages containing mercury treatment.

The American workers are in favour of injections of sodium bismuth tartrate (Searle) intramuscularly two c.cm. of one and a half percent solution twice weekly. Ten injections are given along with oral exhibition of potassium iodide in suitable doses.

Once the patient's symptoms have abated under the above therapy, one can try intravenous or intramuscular injections of *organic arsenicals*. But care should be taken to start with small doses, and the initial safe dose appears 0.2 gram. for an average adult. Arsenoxide once weekly on saturdays with rest in bed on Sundays may be suitable.

Bismuth. According to Boland and others bismarsen is better than mercurials and potassium iodide in congestive failure of the heart, in cardio-aortic syphilis. Bismostab or hypoloid bismuth metal in 0.2 gram doses by weekly intramuscular injection, of ten to fifteen such, in a course, may be quite useful. Sodium bismuth tartrate, the American favourite in cardio-vascular syphilis has already been discussed.

Iodobismuthate of quinine. Three c.cm. of a ten percent oily suspension per dose, should be spread over a period of two to three years as discussed above.

Aortic incompetence and aortitis. Marked enlargement of the heart or pronounced incompetence with or without cardiac pain, *generally contraindicate organic arsenicals*. To relieve pain, injections of bismuth and potassium iodide per mouth are often good. But pre-cordial pain persisting after complete rest in bed may mean stenosis or occlusion of the coronaries, rather a serious matter, requiring special treatment.

Heart failure. Rest, bismuth, potassium iodide, sedatives, when oedema is present, salyrgan, beginning from 0.5 to 1 c.cm. once a week are effective. Digitalis is contraindicated, according to Lambert 'syphilitic heart is apt

go to pieces on large doses of digitalis quicker than on anything else.' Glucose, euphyllin and others may be tried.

Angina of Syphilitic Origin. Absolute typhoid rest is essential, it is better to try either bismuth or mercurial injections combined with oral iodide therapy. Specially rest must be absolute when there are symptoms of cardiac failure or marked incompetence of the aortic valves.

Other remedies such as morphine, euphyllin, glucose, adrenalin, ephedrine may be given consideration of, sometimes in hypertensive subjects 1/100 gr. doses of trinitrin tablets are of use. Nepenthe or tr. opii in 10 to 20 m. doses, morphine and atropine may have to be used freely when the pain does not disappear on rest. Inhalation of oxygen turned out at a rapid rate (two liters per minute) is useful to relieve pain when there are signs and symptoms of deficient oxygenation.

Aneurysms. Rigid restriction of physical exertion is imperative in cases where aneurysm is present. When the size is moderate with or without pressure symptoms, intensive but cautious antisyphilitic treatment may result in a reasonable recovery. The best remedies are pot-iodide, bismuth and hydrarg, the first given orally the last two by intramuscular injections. When there are obstructions in the branches of trachea, iodides are not well tolerated and should be given cautiously, with a watch upon the untoward subjective symtoms and objective findings. In these cases injections of entodon, which is a twenty percent solution of hexamethyldiaminoisopropanol-biniodide, in ½ to 2 c.cm. doses, said to give off iodine readily and may be tried. In intolerance of pot iodide this preparation of Bayer is said to be of use. Iodogenol, a French preparation is also said not to produce iodism.

Rest, absolute and complete, is imperative in all these cases with or without heart failure. Failure symptoms indicate that rest is imperative.

Too vigorous methods of therapy are always contraindicated in syphilitic lesions in such vital but delicate structures as the aorta, coronaries, and other vessels where slight aggravation of the lesion may mean even death. So, as in all our treatments, individualised and cautious procedure, based on the experiences of yesterdays result is the safe guide in handling of such vital structures.

The Results. They are quite well when the treatment is begun before marked aortic incompetence and cardiac enlargement start, though unfortunately, it is not possible to

get many cases at this stage. It is only at the early stage of the disease, that adequate treatment may produce anything like a clinical cure. Once the aorta is damaged, even to a slight extent, may terminate to a serious issue, and thus result in incompetence, inspite of vigorous treatment. But even in frank aortic incompetence, if adequate treatment is instituted life appears to be prolonged. Because cases of early cardiac failure of syphilitic origin seldom live more than eighteen months, but vigorous anti-syphilitic treatment with prolonged rest may prolong life.

TREATMENT OF NEURO-SYPHILIS

Meningeal and vascular, syphilis should be treated in the line of systemic infection by spirochaetes as already suggested. Here potassium iodide in gradually increasing doses beginning from small ones say initially starting from ten grs. may have to reach to one drachm, thrice daily after food with hot milk. It is of special use by dissolving gummatous tissues and giving easy access of the spirocheticidal drugs to the hidden organisms. Penicillin is worth a trial in all forms of neurosyphilis see pages 59, 60 etc.

In all forms of nervous manifestations of syphilis the treatment has got to be very prolonged and intensive.

PARENCHYMATOUS SYPHILIS.

Tryparsamide[48] is generally useful in the treatment of parenchymatous neurosyphilis. The following facts about tryparsamide are important.[49,50] It is a pentavalent arsenical compound of the atoxyl series.

(1) Tryparsamide—should be employed and limited to the neurosyphilis of the paretic and preparetic types. (2) It should not be used except after six to eighteen months as according to Moore[51] and his coworkers it is of special use only in neuro-syphilis which do not usually appear before six to eighteen months after the primary infection. (3)

48. Sloan and Woods, (1936), Amer. Jour. Syph. Gonorr and Ven. Dis. 20; p. 583.
49. Stokes and Chambers, (1928), Amer. Jour. Med. Sci. 175; p. 705-708.
50. Lorenze (1928), Jour. Amner. Med. Assoc. 90; p. 1285.
51. Moore and others, (1924), Ibid. 83; p. 888.

Like all other forms of therapy in syphilis, the earlier the treatment is begun the better is the prognosis. In neurosyphilis too this holds good. (4) Tryparsamide sometimes produces therapeutic shock in patients with signs and symptoms of cerebral involvement. In mildly excited types, even maniacal phase may appear for which the patient's relatives must be made to get prepared and ready. (5) There is a general tonic and weight increasing effect of tryparsamide, but there are a few stray cases in which symptoms of intolerance may appear. Advanced neurosyphilis, in thin subjects, the drug should be given cautiously, as cases of death even are reported from such treatment specially when given in over dosage. (6) Tryparsamide is given in about one to three grams. Smaller doses tend to cause irritation. It is injected intravenously very slowly in ten c.cm. of redistilled water, only once a week, upto a total of thirty grams. per course. They may be repeated. (7) The great drawback is its tendency like atoxyl to *produce optic atrophy, which generally comes within the fifth to the tenth injections.* Mere examination of the fundus is not enough but careful examination of the field of vision by exact perimetric tests and the test for the acute-ness of vision are essential (8) After a period of rest of thirty days, cases have been treated again in whom optic atrophy threatened.

Under tryparsamide therapy in a series of 317 cases of neurosyphilis eighty seven per cent were found satisfactorily restored to physical and mental health, after a five to six years' period under observation. But it must be remembered that tryparsamide is of special use in parenchymatous neurosyphilis. Penicillin is worth a trial.

TABES DORSALIS

Tabes. The treatment mainly aims at preventing further destruction of the neurons and other structures, caused by the disease.

One of the best result is claimed to have been obtained by *silver salvarsan* given per vein in 0.15 to 0.25 gram doses, and ten weekly injections constitute one course. Sometimes good results followed spinal drainage by lumber puncture an hour after the intravenous injection.

Bismuth about 39 g and about 30 g of tryparsamide are a course to be repeated four times a year for 2-4 years; with oral exhibition of pot. iodide. The course of treatment should not be lesser than at least two years. Maximum treatment is indicated for these patients. Tryparsamide is contraindicated if there is optic nerve involvement.

Malarial therapy and artificial hyperthermia have proved of value. They are in the same lines as indicated in the treatment of general somatic syphilis. More recent workers are in[52] favour of mechanical hyperthermia and facts are in its favour. *Ataxia* is treated by re-education.

The patient should be at rest, and warmth is gratifying. Any debilitating condition such as fatigue, worry, cold, drenching, alcohol, excesses of all types are to be avoided carefully, For the *lightening pains,* aspirin phenacetin 5 grs each with half a grain of codein may be useful. Fur-methide or Carbachol orally or injection may be useful for *retention of urine.*[53]

GENERAL PARALYSIS

General Paralysis. No therapy is of such use as artificial malarial inoculation, and artificial hyperthermia. Plasmodium infection induced artificially as advocated above in the general treatment, is the therapy of choice. The limitations, risks, and other considerations dealt with above hold good here too.

The general lines of treatment by tryparsamide and bismuth for prolonged periods and improvement of general health by tonics, vitamins, proper care of teeth, mouth, oral hygiene all are of value.

N.B. Lastly the treatment of all forms of neuro-syphilis either meningo-vascular or parenchymatous require prolonged and adequate treatment, in the lines chalked out under the lines of somatic syphilis.

CHAPTER XXXXI

TYPHUS GROUP OF FEVERS

(Rickettsial infections in Men)

DIAGNOSIS

A widely distributed disease with epidemic in north and north-west India and present also in many parts of

52. Simpson, (1936), New York State Jour. of Med. (Ohio) 36; Sept. 15th : p. 1290.
53. Bondy and Altschule (1942), Am. Jour. Med. Sci. 204 p. 334.

Asia,[1] Europe Africa etc. Recently scrub typhus is described in Eastern Asia, and tick typhus was described at the foot of the Himalayas[2] etc.

Though the Rickettsiae cannot be cultured by ordinary methods, yet recent studies[3] on inoculation by yolk Sac method have demonstrated minor differences between the various strains of rickettsiae,[4] thus making the problem of universally protective vaccine and the question of protective immunity rather complicated.

Clinically the common typhus (louse borne) is generally an epidemic or endemic disease, characterised generally by sudden onset of fever with headache which may be very severe, chills, general aches and pains after *an incubation period of about* 10 *to* 14 *days*. The temperature rises at its maximum in 3-4 days, in a typical case the patient looks heavy, dull, as is apathetic, may take no interest in the outer world, and may resemble a case of typhoid fever making the name typhus means a cloud true. There may be mild atypical cases also,

Rash—is seen in all severe cases usually on the 4th to 5th days but may be slight and evanescent in children and in mild infections. They appear first on the axillary folds, chest, in back of the trunk they may be profuse. *These eruptions in a typical case pass through, papular, macular and petechial stages. The subcuticular mottling of the last stage is very suggestive. Purpuric patches with haematemesis, melaena and haematuria etc. suggest the grave nature of the case.* Leukocytosis with neutrocytosis is the rule. The course is about a fortnight. The mortality rate varies from 15 to 40 percent, *being a very grave disease for persons above the age of* 40 *years*.

Complications—like typhoid fever are varied and numerous. It has got to be differentiated from pneumonia due to hurried respiration in some, and due to unusual mental torpor from meningitis, encephalitis, uraemia etc.

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1. Medical Annual 1945. Scrub typhus. p. 286.
2. Megaw (1916) Ind. Med. Gaz. 52 p. 15.
3. Grief Pinkerton et al (1944) J. Exper. Med. 80 : 561-574.
4. Hamilton (1945) Proc. Soc. Exper. Biol. and Med. 59 : p. 220-226.

Diagnosis—is confirmed besides clinical points by the development of an ascending titre of agglutinins in the patients blood usually against proteus x 19. This typical reaction is known as Weil-Felix reaction.

Other varieties are :—1. Rocky mountain spotted fever *tick-borne.* 2. Endemic or murine typhus *flea borne.* 3. Tsutsugamushi fever or Scrub typhus. Miteborne. 4. Trench fever again louse borne. 5. Q. fever, on which much is discussed lately in America.(A)

TREATMENT

Preventive —Delousing methods—besides cleansing and boiling of patients clothes etc., the patient has to be cleared of lice. The contacts and community at large where even one case of typhus occurs, are exposed to risk to assume epidemic proportion of a severe nature. Probably the best and most effective insecticide for this is D.D.T. It should be powdered well in the trousers, skirts, down the sleeves into collars, tucks and folds as a matter of fact to any place where the lice might cling. Beds, coverings bed clothes, and everything having the remote possibility of harbouring lice should be liberally dusted with D.D.T. powder. The effects are lasting and fruit-ful. There may remain enough concentration of the insecticide in the fold of sleeves etc. A five percent solution in Kerosene of D.D.T. one quart per 300 square feet proves effective against most insects including, mosquitoes, fleas, etc. Above combined methods may be utilised for the prevention of insect-borne diseases like, relapsing fevers, sandfly fever, Kala-azar, tropical-sore, dengue, sleeping sickness, plague (see prevention of plague p. 243, 244).

Vaccine made of formalin or phenol killed culture of rickettsia prowazeki grown in the yolk sac of the developing chick embryo, injection of one cc. at the interval of one week till three are taken, followed by a stimulating dose every six months in the endemic zone, confers protection and reduces the severity and mortality rate of the infection, although the rate of attack may not be much influenced. The living vaccines cause severe reaction and is rather risky. Contacts should be observed for three weeks for possible infection.

A. Series of articles in Jour. Am. Med. Asscc. (1947 March 22) p. 813 to p. 824.

Curative Para-aminobenzoic acid[5] was found useful when given orally in 2 g doses[6] every 2 hourly either in capsules or as powder till the temperature came down to normal[7] and was better tolerated when given with half a tea spoonful of soda bicarb with a glass of water per dose.[8] In rickettsia orientalis of scrub typhus it has got to be given by injection as well as orally.[9] The drug is absorbed and excreted quickly[10] hence the need of giving it 2 hourly. Total dose required may amount upto 200 g in a few cases. The results are better the earlier the treatment is started in the course of the disease. It appears to be converted to para aminohippuric acid in the liver presumably by conjugation of amino-acetic acid[10] in the liver as in the case of benzoic acid. Hence liver disease may cause toxicity. Kidneys excrete[11] it finally. It is expected to be useful in all rickettsial infections. *Methylene blue* is being lately given orally with some result.

Penicillin has been found useful specially for complications of this infection, see also page 57.

Sulphonamides appear not of appreciable effect. Penicillin with para-aminobenzoic acid appeared more effective.

Scrum—Claims have been made in favour of convalescent serum from a person cured a fortnight ago Twenty c.c. intravenously daily till 200 c.c. are given may be useful. Immunised purified horse serum in the above doses may be given intramuscularly with precautions to be taken against anaphylaxis and injection of foreign sera as described on pages 10, 11 etc.

General measures are those described in the chapter on fever page 12 and also under typhoid fever on page 117 etc. The treatment of *complications* should be according to indication also as in typhoid fever as described on pages

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5. Dyer (1944 April 22) Jour. Am. Med. Assoc. 124: p. 1165-1172.
6. Anigstein and Bader (1945) Science 101 : p: 591-592.
7. Smith (1946 Aug.3) Jour. Amer. Med. Assoc. 131 : p. 1114.
8. Yeomans et al (1944 Octo. 7) Ibid 126 p. 349-356.
9. Murry et al (1945) Proc. Soc. Exper. Boil and Med. 60 : p. 80-84.
   Snyder et al (1945) Ibid. 60 : p. 115-117.
10. Smith et al (1946) Federation Proc. 5 p. 134-155.
11. Smith et all (1945) J. Clin. Invest. 24 p. 388-404.

126 etc. *Convalescence* is usually not very long but reversion to work should be slow and about four weeks rest, good diet, tonics, etc. should be enjoined. For details see page 133 etc.

COMMONER DISEASES OF LUNGS

CHAPTER XXXXII

CHRONIC BRONCHITIS & EMPHYSEMA

(Winter Cough)

Diagnosis. Chronic bronchitis of the winter months mostly in males of past middle age, specially of certain families often with emphysema[1] at the later stages, resulting as a rule from constant and sometimes paroxysmal bouts of cough, more trouble-some early in the morning and evening, is pretty common in big cities. The patient often does not feel relieved until he has been able to expel secretion. The *history of these cases* is generally something like the following. A person who has an occupation in dusty or smoky atmosphere one stagnant winter evening, probably after an exposure to chill or after getting soaked, or due to insufficient clothing, diet etc., got a cough in which the throat and upper respiratory passages were mainly involved. The next winter a bronchitis of short duration develops, to recur in the next but lasting longer, and gradually in successive years the affection lasts longer and the free interval decreases till in bad cases the suffering of the patient becomes more or less continuous with a free interval during the height of the summer. There may be associated with this chronic bronchitis and emphysema, tuberculosis, fibrosis of the lungs, bronchiectasis, sinusitis, terminating in congestive cardiac failure, due to the lack of normal power of aspiration of the venous blood and compression of the blood vessels in the lungs. Haemoptysis, subcutaneous emphysema, pneumothorax etc., from rupture of a bulla in the lung are not uncommon.

The emphysema is generally secondary to alterations, fibrosis in the bronchial tree, pulmonary blood vessels and lung, owing to spasm or mucous obstruction, in the bronchi or bronchioles resulting from repeated inflammations.

1. Christopherson. (1933), Jour. Amer. Med. Sci. 186: Oct. p. 504.

The *third clinical condition* associated with it is asthma, and is probably related to the obstruction with spasm of the tubes and emphysema. But to ascertain the relation cause and effect in these conditions is extremely intricate and the general opinion of German[2] workers in this line is that all cases of chronic bronchitis and emphysema specially when occuring in earlier years have an allergic or asthmatic basis that is to say, a reflex hypersensitivity of the respiratory apparatus, chronic infections assist in it.

As regards physical findings, the chest is usually found in the position of inspiration and may appear very full or barrel[3] shaped, the expansion at inspiratory effort is curtailed from normal two to three inches to one inch or so. The apex beat may not be palpable due to emphysema, there is hyper-resonance or rarely a drum like note on percussion, the cardiac and liver dullness may be obliterated or appear too small. The auscultatory findings are variable, prolonged expiration but scattered rhonchi distributed more or less bilaterally help to come to a diagnosis. In asthmatic states there may also be present the typical wheeze. There may be found the atrophic type of emphysema where the diagnosis is not easy.

Investigating the case the possibility of tuberculosis should be remembered specially when the cough persists during the summer months and the patient loses weight. Skiagraphic examination, after lipiodol injection to exclude bronchiectasis, unsuspected tuberculosis and fibroid condition of the lungs, earlier in life, should have to be excluded. Culture and microscopic examination of the sputum should be done. Where possible a bronchoscope[4] may show some important hitherto undetected change.

TREATMENT

Prophylaxis. As chronic lung inflammation and cough lead to other troubles like emphysema and asthma, the first chain in this vicious circle, namely the bronchitis should receive our best attention and thus the cough which is mainly responsible for the production of emphysema be checked. Sometimes the fault may be found in some septic

2. Medical Annual, (1936), p. 96.
3. Hurtado, Fray and others, (1934), Jour. Clin. Invest. 13 : p. 1027.
4. Van. London, (1937), Jour. Amer. Med. Assoc, 108 : p. 1490.

focus either in the throat or the sinuses, teeth, tonsils, gall-bladder or in, obesity, nephritis, diabetes, arteriosclerosis and so on. Work in dusty, damp, smoky, overheated or draughty conditions are to be avoided or modified. If this cannot be helped, the patient should at least go to a dustless dry atmosphere having a bracing climate, during those months of the winter season, when he is found to suffer most from this trouble. All excesses in smoking, drinking, over-work, chill, fatigue, etc., are to be avoided. Constipation is bad for these subjects.

Autogenous vaccine in suitable doses may be of use. But in the choice of dose much care is needed. If the patient shows extra sensitiveness to vaccines of average dosage lesser number of organisms should have to be chosen. In naso-pharyngeal sensitiveness, oily suspensions of menthol, chloretone and other drugs like mistol or endrine may be useful. Preparations containing ephedrine are of service in cases showing asthmatic tendencies, sensitiveness, and where there is much local vascular congestion. Endrine contains small amounts of ephedrine, hence is useful in these conditions.

The patient should be made to live in the open as much as possible. Sudden variations in temperature are to be avoided. Hot stuffy rooms, like cinema houses, theater-halls are bad for him. Whenever possible change to a better and bracing, dust, or smoke free dry atmospheric condition is beneficial. High altitudes are, as a rule not well tolerated by emphysematous subjects. Sea-side places or sea voyages are of service to most of them. They are as a rule too warmly clad and sleep with doors and windows closed. These are pernicious habits and should be rectified.

Curative

In this chronic and long lasting disease active co-operation and perseverance on the part of the patient and his financial condition to carry out instructions are of importance for achieving any lasting results.

Change to a better place. Change to a more bracing cool climate with a dust free atmosphere is of some help. Very cold places or high altitudes are unsuitable. Change for a few successive years to a better and less congested place, even change to a village, from the smoky atmosphere of big cities during the winter, may be of some help. Sea voyages may prove particularly useful for some. During unfavourable weather the patient should stay indoors with doors and windows open, instead of risking exposures.

If there is an acute febrile exacerbation of bronchitis, proper treatment with penicillin and sulphadiazine and rest in bed is to be instituted without any delay. In chronic cases on the other hand, an outdoor life judiciously spaced with rest and proper treatment may be of benefit.

Medicinal treatment. As most of these persons have a tendency to deficiency of hydrochloric acid secretion in the stomach and their appetite is not very strong, all expectorants, tending to cause catarrh and irritation of the stomach, are not very salutary drugs to be exhibited to these patients.

But a prescription like the following may be of use.

Potassium Iodide	gr. 3
Ammonium Chloride	gr. 8
Vinum Ipecac	m. 5
Syrup Tolu	m. 120
Infusum Senega	upto fl. oz. 1

when there is profuse expectoration, with never-ending stream terebene and balsam of Peru in ten drops with sufficient pulv acacia, made into an emulsion and with syrup may be of service. In the majority of these cases where there is generally asthmatic tendency coupled with constipation, a prescription like the following may be of some use.

Pot. Iodide	gr. 3
Liquor Arsenici Hydrochlor	m. 3
Tr. Belladonna	m. 5
Ext. Cascara Sagrada liq.	m. 30
Ammon Chloride	gr. 10
Ephedrine hydrochlor	gr. 1/4
Syrup Tolu	m. 120
Infusum Senega	upto fl. oz. 1

In cases of the elderly persons with anaemic tendency, syrup tolu may be replaced by syrup ferri iodide, in 2 dram doses. In cases of foul sputum, in place of ammonium chloride, thiocol in four to six grains may be used with advantage. The medicine is to be taken twice daily after some food, preferably in sips with equal quantity of warm syrup. The well-known "hot-water mixture" of the Bromptom hospital described on page 181 is of good use to promote expectoration on rising in the morning, and to clear the tubes before going to bed.

The hawking dry fruit-less cough, may have to be allayed by syrup codeine phosphate or by ordinary linctus, as trochisci glycyrrhizae, or ipecac et morphine and others. The menthol pastilles kept in mouth may be of some relief, see also page 181 for other details.

Inhalations generally though not of much relief, yet tincture benzoin compound is probably one of the best for this purpose. Oil of eucaliptus, oil of pine, or creosote may be given through inhalation in a respirator. Duke-Fingard[5] method of inhalation treatment has proved effective in these cases. Aerosol penicillin as on page 53 may be tried with advantage.

When there is *sleeplessness due to cough etc.*, or exacerbation of asthma, a simple sedative mixture containing one dram each of linctus diamorphinae cum ipecac, linctus diamorphinae et scila, syrup-pruni serotinae, at bed time may do good. When they fail, hypnotics like, either ortal one tablet of four grs., or medinal in three to five grains or ipral calcium or allonal one to two grs. may have to be tried. When they fail heroin 1/12 gr. or morphine and atrophine¼ gr. of the former and 1/200 gr. of the latter may be used with advantage. But these hypnotics of the barbiturate group and morphine preparations are depressant to the respiratory centre, hence unless the insomnia is very exhausting these remedies should not be prescribed. Paraldehyde and bromides in suitable doses may produce some sedative effect and are very suitable for these cases, notably when the heart is weak.

In associated congestive cardiac failure the underlying pathological process is usually so advanced that complete recovery is very unlikely. In the presence of cyanosis, dyspnoea, and engorgement of the veins, congestion of the liver, all the methods followed to relieve congestive cardiac failure may be of use. Cough needs be relieved at all costs otherwise the heart will get worse.

Trained breathing exercises with forced expiration[6] *have* brought about an advancement in the treatment of this conditon. Abdominal belt has been, of late, introduced for treatment with considerable success. Christie[7] (1934) states that the diaphragm can be raised again in emphysema by increasing the intra-abdominal pressure. This is not possible to be done by the emphysematous persons unaided as

5. Fawcus, Greene and Houston, (1937), Brit. Jour. Surg. April. p. 773.
6. Hurtado, Fray, and Mc Cann, (1933), Jour. Clin. Invest. 12 : p. 833.
7. Christie, (1934), Jour. Amer. Med. Assoc. 103 : p. 384.

they generally have flabby toneless musculature of the abdomen. Under these conditions a suitable belt[8] pressing on the lower abdomen between the umbilicus and symphysis pubes may however, increase the intra-abdominal pressure sufficiently to raise the diaphragm. This gives great relief and brings the diaphragm[9] once more into play in inspiration and that to some relief of the patient.

For average patients *a support with a pad of cotton in lower abdomen* beginning from just above the symphysis pubes covered by a suitable binder may be of some use. This support should be fixed lying in bed, preferably by raising the buttocks on a pillow, as it brings the viscera in the upper abdomen and the support being fixed while lying, makes up the deficiency sometimes very ably. In the experience of the present writer this improvised support gives some relief to most of this class of patients provided they follow the instructions carefully and properly. This support may be taken off while sleeping at night. Breathing exercises as in asthma are also of use.

Counter irritant liniment rubs on the chest as in pneumonia p. 142 thrice or twice daily are useful.

Clothing. This should be reasonable. In the winter it should not be too heavy, but sufficiently warm to protect the patient from getting a chill, notably when out in the open air. In the summer, there is always the risk of getting drenching perspirations, which may help in precipitating a cold and catarrh, and this the subjects of chronic bronchitis must avoid.

Diet. As any gastro-intestinal upset is likely to influence the cough and dyspnoea adversely, specially any gas in the stomach, and as chronic cough in its turn throws a great strain on the right side of the heart leading to its dilatation, ultimately giving rise to congestive cardiac failure, the utility of giving a plain and easily digestible diet is to be remembered. In fat subjects, with or without diabetes, carbohydrates should be reduced. In thin subjects, butter, milk, codliver oil or some vitamin concentrate like adexolin, vitadex, haliverol, navitol, etc., may be added with advantage, particularly due to their A and D vitamin contents. In these persons there is as a rule *deficiency of hydrochloric acid secretion hence* it is given after meals with some effect. Solid

8. Burns and Herbst, (1932), Munch. Med. Woch. 79: p. 1385.
9. Alexander and Koventz, (1934), Amer. Jour.Med. Sci. 187: May, p. 687.

meals should not be given at night and if taken at all it should be finished by dusk, as in asthma. The noon meal should be the principal one. In cardiac failure or associated renal disease with or without hypertension, a more or less lacto-vegetarian diet may have to be prescribed. Adequacy of B and C vitamins is of value. Angier's emulsion and Scotts emulsion may be tried specially when the intestines are bad notably with constipation.

Other forms of treatment. Various devices are being improvised to bring back the elasticity of the lungs. Compressed air chambers may give considerable, even some permanent relief. But it is not to be advocated for plethoric hypertensive subjects. There are certain spas and watering places in England and Europe where special methods of treatment are given with some, but variable success. Secondary heart involvement with right heart failure is a real danger and should be prevented by relieving the cough the causative factor of "cor pulmonale."

CHAPTER XXXXIII

BRONCHIAL ASTHMA

Definition. The derivation meaning of term asthma is "gasping." It is used to indicate a peculiar type of dyspnoea which is characterised by difficulty in inspiration, but more so in expiration or both and accompanied by an audible wheeze; apparently due to obstruction to the flow in and out of air in the glottis and tubes. As there are so many varieties of conditions giving rise to the symptom complex of asthma, that the diagnosis of this syndrome should, if possible, be qualified by such terms as pollen asthma, horse asthma, food asthma etc., according to the sensitiveness of the patient and the allergen giving rise to the symptoms. The term bronchial asthma is commonly applied to those attacks of expiratory dyspnoea, going on steadily and in regular attacks without any apparent disease. It is not exactly the disease but a symptom complex.

Peculiarity. Majority show symptoms before the age of of twenty-five[1] twice as frequently in males as in females. It has a tendency to run *in families of a neuropathic tendency and unstable nervous system, as shown in other members or generations, either by urticaria, hysteria, migraine, angio-*

1. O. Keefe, (1936), New Eng. Jour. Med. 214 : p. 63,

neurotic oedema, epilepsy, dermatographia, eosinophilia, etc. There may be undue susceptibility and sensitiveness towards foreign proteins. This may be transmitted to the next generation. Any disease which tends to lower the threshold of resistance may precipitate an attack. Exhaustion, fatigue, worry etc., may act in the same way.

Exciting agents. The factors in the production of all allergic states are in short the following.[2]

The factors are in components of two, e.g.
A. Allergic heredity and tissue damage. B. Particular allergen & exciting factor, resulting in, allergic reaction.

1. Dietary
2. Environmental
3. Nasal
4. Toxic
5. Psychic
6. Endocrine
7. Physical
8. Chemical
9. Mechanical

Absorbed : –
1. Inhalation
2. Ingestion
4. Infection
5. Contact and carried by blood to shock organ

As there are so many varieties of cases and factors, it would be too much to expect cure of all cases by one fixed mode and line of treatment.

Vagotonia. In these persons vagotonia predominates and stimulation of the vagal endings in the bronchus may simulate the signs and symptoms of bronchial-asthma. It is characterised by vascular turgescence of the bronchial mucous glands and so on.

Irritation, Infection, Digestive Symptoms.

But it should clearly be understood that this symptom complex is not due only to allergic phenomena, but also to vagotonia, lowered resistance, undue susceptibility, inherited or acquired, to foreign prote ns etc. Diseases of the nasopharynx, chronic catarrh, polyp, adenitis, unhealthy tonsils, deviated septum, acute or chronic infections of the respiratory or other systems are sometimes the potent causes of asthma Digestive disturbance, achlorhydria, overloading of the stomach, irritation of intestines, constipation etc. are sometimes the exciting factors. An unstable nervous system, excitement, depression may induce an attack.

Generally though begins early in the morning or late at night yet may start at any time of the day or night. There

2. An index of treatment, (1936), Allergic diseases. p. 23 Edited by R. Hu.chison.

may be undue irritability (asthmatic aura) manifested by restlessness, irritability, exaltation or depression, itching of the nose, chin, bouts of sneezing, flatulence, coryza, polyuria and so on.

Such warnings may not be constant. In a typical attack the patient rises up from bed with a feeling of suffocation, there may be, specially in the early attacks, some restlessness, anxiety and a sense of alarm. The young adult sitting up. leaning forward, either on the table, or holding on to something, so that every accessory muscle of respiration may help to get breath for him, is a picture which seldom misleads the careful observer. Though laboured, the respiration is rather slow but difficult with a prolonged expiration. The expression is anxious and distressed, the patient looks pale and the lips are dusky. The wheezing may be audible, skin is usually moist and sweating may take place. The chest already in the phase of inspiration, though moves as a whole through the violent activity of the accessory muscles of respiration, there is hardly any true expansion of it. It is hyper resonant and emphysematous with obliteration of the cardiac and hepatic dullness. On auscultation sounds like those in music-box, giving out rales of all kinds, mostly dry and and squeaky are heard. The expiration is prolonged, may be accompanied with true bronchial wheeze. On measurement there is very poor expansion of the chest on inspiration.

Eosinophilia, even upto thirty-five per cent may be encountered in the blood. The pearls of Laennec and Curschmann's spirals are highly suggestive. The sputum abounds in eosinophiles. There may also be seen Charcot Leyden crystals.

Types. Rackemann[3] (1927) has suggested five distinct types clinically.

Tropical Eosinophilia or Eosinophilic Lung[4] :—

A clinical condition indistinguishable from bronchial asthma is not uncommon, showing very high eosinophilia in blood, sometimes as high as 90 percent.[5] though usually varying from 33 to 73 per cent or there about. Sometimes the skiagram of the chest of these persons resemble that of the

3. Osler's Modern Medicine, (1927), Vol. 4 : p. 105-7.
4. Medical Annual (1945) Monson Bahr p. 331.
5. Frimodt Moller and Barton (1940) ind. Med. Gaz. 75 : p. 607.

miliary tuberculosis.[6] In some cases fever cough, loss of weight, even rarely haemoptysis have been reported. It is being differentiated from Loffler's syndrome.[7] The cause appears allergic, *treatment*[8] besides other things consists mostly in intramuscular injections of acetylarsan or intravenous arsphenamines. Prolonged oral use of liquor arsenicalis has done good in some cases.

Complications in Asthma. Out of the commoner complications, increasing[9] emphysema, oedema of the lungs, engorgement of the right heart with signs and symptoms of congestive cardiac failure are of importance and of somewhat grave consequence. These patients of secondary congestive cardiac failure seldom recover from the third or fourth attack, though they may get over the first or the second. Not uncommonly tuberculous infection is met with in asthmatics. Bronchiectasis, haemoptysis, pneumothorax, subcutaneous emphysema may complicate the picture.

This condition has got to be *differentiated from* chronic bronchitis with emphysema, cardiac asthma, uraemic dyspnoea, hay fever and other respiratory troubles and congestive cardiac failure. More uncommon difficulties may be met with in cases of thymic enlargement in children, in enlargement of tracheo-bronchial lymph glands in young subjects. Pulmonary new growths, aneurysm, foreign bodies etc., may also present difficulty.

TREATMENT

This may be considered conveniently under several heads : --

(1) Treatment during an attack.

(2) Management during the free period.

(3) Desensitization and non-specific factors.

(4) General—Comprising of 1. Diet. 2. Medicines. 3. Miscellaneous.

Abortive treatment. Adrenalin one in hundred is being sprayed into the throat by a specially devised powerful spray (P.D.) to abort an on-coming attack of asthma, with some success.

6. Weingarten (1943) Lancet I : p. 103.
7. Loffler (1936) Schweiz Med. Woschr. 66 : p. 1069.
8. Simeons (1943) Ind. Med. Gaz. 78 : p. 271,
9. Livingstone and Gillepsie, (1936), Qurat. Jour. Med. 29 : p. 287.

Preliminaries. The patient may have to be propped up. The ventilation needs be good, clothing suitable for the season and condition of the patient.

DURING AN ATTACK.

Adrenalin. Adrenalin chloride one in thousand solution, about two or three minims for a young patient and about half a c.cm. or seven to ten drops for an adult should be given either subcutaneously or intramuscularly. The preparation, unless very fresh, is not effective and may require, when old, about one c.cm. though in worst cases of typical asthma seldom more than half a c.cm. is required, notably when the solution is fresh. Adrenalin in oil or hyperduric adrenalin has a longer and lasting effect after injection.

Continuous administration of Adrenalin. As the action of adrenalin chloride is very short lasting, one may have to repeat these injections every hourly to relieve a bad spasm. Some workers advocate the hypodermic needle to be kept under the skin, so that every hourly a few minims of the solution, filled in a small syringe may be given at will, as required. In "status asthmaticus" two minim doses of adrenalin injections may have to be repeated every few minutes, later every quarter of an huor for the first hour, each half hourly for two hours, every hourly for the next three hours and every two to four hours till bed time. In severe cases large amounts but small individual doses of adrenalin are necessary though the relief from this drug appears slower and less adequate. *Asthmolysin injections* subcutaneously and *never intravenously* relieved a case of status asthmaticus, refractory to injections of adrenalin chloride solution It is said to contain pituitrin besides adrenalin. Adrenalin in oil is suitable in these cases.

Refractory cases. In those attacks of undoubted asthma not relieved by the injection of a solution of simple adrenalin chloride, the following solution in proper doses may have to be given.

Morphine sulphate	gr. 1/6 to 1/4
Atrophine Sulphate	gr. 1/150 to 1/100
Adrenalin Chloride Solution (1 :1000)	upto 1 c.cm.

One minim of this solution is injected every fifth minute or so instead of adrenalin alone, and the process is continued until the desired amount is given or the expected result is derived. Even in full sized individuals, not more than one-fourth preferably one sixth of a grain of morphine should be injected. Bigger doses of it may abolish the cough

reflex so much that the patient may not be able to expectorate and thus be drowned in his own secretions. Morphine should be used *with caution* as it may rarely cause death. Once this combined solution has produced the desired effect simple adrenalin may be utilised for further check of the disease. Adrenalin appears most effective when given early in an attack.

Ephedrine. Recently ephedrine in half or three quarters to a grain doses in adults, orally appeared to check the spasms in some cases. A combination of adrenalin and ephedrine is utilised for this. The adrenalin exerts its immediate effect to be continued by the sustained action of ephedrine. But ephedrine is not always so effective as adrenalin.

Dose of ephedrine. For boys over seven years half a grain, for children of one year or above one-fourth of a grain, for infants under one year one-eighth of a grain are the usual effective doses. But there are some susceptibles in whom ephedrine may produce palpitation and other unpleasant symptoms.

Inhalation. Nielse[10] (1936) has used, adrenalin 1 g, chlorobutol 0.09 g, hydrochloric acid (2N) 2.8 c.cm., sodium bisulphite 0.01 g. distilled water upto 10 c.cm., to be nebulized in triplex spray and inhaled, this relieves asthma almost immediately and the effect lasts nearly an hour or more. In febrile asthma aerosol penicillin inhalation is of use see also page 52 etc. Febrile asthma may be treated by sulphadiazine and injections of penicillin.

Medicines. Hot strong coffee may help in some cases. The popular powders, cigarettes and sprays may or may not be effective. A powder like the following one has been found useful in relieving paroxysms.

Euphylline, or Theophylline, or Aminophylline	gr. 4
Ephedrine hydrochloride	gr. ½ to 1
Phenazone	gr. 2
Luminal	gr. 1
Atropine sulphate	gr. 1/100
Sugar of milk	upto gr. 10

one powder when the paroxysm is intolerable, and should not be repeated before four to six hours.

If the attack does not yield to the above simpler lines of treatment, immediate exciting cause should be sought for,

10. Lancet, (1936), ii, p. 848.

such as an indigested meal, a loaded rectum, or some other allergen, such as proximity to animals, feathers, furs, pollen some food-stuff and so on. In such cases emetics, enemata or good carminatives may be of service. Even if the attack does yield to injections of adrenalin, always search should be made for such exciting factors, though one must confess not always with good success. Injections of glucose, alkalies and stimulants orally may be of some service. Recently intravenous injection of 50 mg of *nicotinic acid*[11] in 10 c.c. of sterile water given very slowly has been advocated, but the patient feels flushed and warm and need be given carefully.

As suggested already by the clinical grouping the following thorough investigations may be carried out to facilitate treatment.

History. One should enquire about the influence of season, place, proximity to animals, circumstances under which the patient gets these attacks and so on. Whether emotion or tiredness evokes an attack, if there is any other history of significance, any relation to dietary of any particular type and so on, should be carefully gone into.

Investigations. Careful examination of nose[12] ear, throat for any source of irritation, is of use. Any septic focus any where, may be the cause of the trouble. The chest should be thoroughly examined; a skiagram, the examination of sputum should not only be done for tubercle bacilli, but also a cultural examination may be helpful. *Any incriminating protein* should be utilised for desensitizing the patient particularly if the *skin test proves positive.* Though the results of such treatment are variable and not[13] uniformly successful. The removal of tonsils, adenoids is advisable in suitable cases. For this purpose the opinion of a competent throat surgeon may be of value. In the opinion of some workers cauterisation of the sensitive spots in the nose is of use.

Catarrh of the upper Respiratory passages. Not infrequently asthma is associated with catarrh of the respiratory tracts, generally starting from the nasopharynx. For the bad chronic sufferers from nasopharyngeal catarrh associated with asthma, *the nostrils* should be first washed out with a five to ten per cent solution of cocaine in normal saline, the

11. Melton (1943)) Brit Med. Jour, 1 : 6, 600,
12. Moll, (1934), Brit. Med. Jour. ii, p. 299.
13. Pearson, (1937), Quart. Jour. Med. 6 : p. 165.

head having been thrown back, instillation of about five to ten drops of a eight per cent solution of argyrol with fifteen drops of adrenalin per ounce, may be of distinct service in some cases. There is much running from the nose after this and a piece of linen or silk may be used for soakage of the secretions. When once washed out, the nose will soon regain its normal healthy state. Along with this usual wash a prescription of the following type may be of some use.

Calcium gluconate	gr. 8
Efhedrine hydrochloride	gr. ¼ to ½
Tincture Ipecac	m. 4
Tincture Belladonna	m. 6
Potassium bromide	gr. 8
Syrup Scilla	m. 120
Peppermint water	upto fl. oz. 1

one dose thrice daily.

Local use of Patulin as in common cold, or prothicin (Sharp and Dohme) or *tyrothricin* page 69, etc. instilled locally may be of relief.

When there is the history of chronic bronchitis and cough, all efforts should be made to improve the lung condition. In these cases a prescription like the following one may be of some service.

Ephedrine hydrochloride	gr. ¼
Tr. Belladonna	m. 6
Potassium Iodide	gr. 4
Liq. Arsenicalis	m. 4
Ext. Grindelia Liquid	m. 10
Syrup Tolu	m. 60
Infusum Senega	upto fl. oz 1

one dose thrice daily after meals, in sips with hot water.

The above prescription may be used in cases when antispasmodics and expectorants are indicated. In some cases of *dry bronchial secretion* with cough and asthma one may give potassium iodide grains four, vinum ipecac and antimoniale five drops of each, with syrup tolu one dram, to make up to one ounce by the addition of infusum senega. This was used by the doctors of the olden days with some efficacy when ephedrine was not discovered. These patients are more or less constipated and some laxative or purgative such as liq. extract cascara sagrada in half to one dram, may be added to the above prescription.

Rub the chest. In all chronic respiratory diseases *rubbing of the chest with some suitable liniment* does good by

influencing the cough, and thus improves the asthma. It is is of some use to many and of much use to some.

Nervous System. Most subjects of asthma have irritable and unstable nervous system. There may be sleeplessness, nervousness, either in the individual or a family history of doubtful nervous stability. In such cases bromides in five to fifteen grains twice or thrice a day, with or without chloral hydrate, may be used with advantage. Peacock's bromides contain about fifteen grains of bromide per fluid drachm, and may also be used with some benefit, notably to quieten an irritable nervous system. Prolonged emotion[14] or fear, disturbance of vago-sympathetic balance, causing diminished secretion of the adrenals, predispose the already sensitive to allergic states and asthma.

Diet, Digestion etc. Heavy meal or overloading[15] the stomach is very often rewarded by an attack of asthma, hence it should always be avoided. Unless the patient is found sensitive to any special article of diet, there appears very little sense in withholding particular articles of food, simply because the latter caused some trouble with another asthmatic. The patients of asthma do find relief if they *do not take any solid food after dusk*, at least for two hours before going to bed he should avoid all foods and drinks. Dilute *hydrochloric acid in fifteen to twenty minims* with double the amount of glycerinum pepsini in half a cupful of cold water may be sipped through a tube or through the nozzle of a feeding cup, before the two principal meals and are found useful. This may have to be continued for the rest of the patients' life with some advantage to many and with much advantage to some. As mostly the protein fission products cause these sensitiveness some workers advocate a preliminary carbohydrate diet, to be gradually reverted to protein one by days if not by weeks. Other lines of management for digestive disturbances may have to be attended, specially from the point of view of intestinal toxaemia.[16] Taka diastase and/or allisatin tablets after meals may give relief to some.

Specific desensitization. If the patient is found sensitive to any article, taken either by ingestion, inhalation, or through infection, and so on, injections of the same specific agent or agents, starting from very minute doses, and gra-

14. Livingstone, (1935), Practitioner, 134 : p. 591.
15. Feinberg, (1937), Jour. of Allergy 8 : March p. 280.
16. Adams, (1935), Proc. Roy. Soc. Med. 28 : p. 255.

dually increased, according to reaction and subsequent effect, may be of service.

Non specific, desensitization. Non specific desensitization by milk protein, sterile two per cent peptone solution (Witte's) beginning from minute portions, gradually increased according[17] to reaction may be tried. Witte's peptone in five grains in a cachet, an hour before meals orally may serve as an ideal desensitizing agent. To produce pyrexia bacillus coli or typhoid vaccines have been used intravenously also with some success. Recently 0.3 c.cm. increased by 0.2 to reach upto 1.3 c.cm. of a 7.5 per cent solution of martindale peptone, once a week, till about sixteen, the last few doses being 2.5 c.cm., have been advocated[18].

Autohaemotherapy. A few c.cm. of blood is with drawn from the median basalic vein of the patient and given intramuscularly either in his opposite deltoid or the gluteus. Generally one begins from one to two c.cm. every fourth day to a week, till near about ten c.cm. are reached. This has proved of some use in those cases where no apparent cause in the respiratory passages or any where else is to be found out One to two c.cm. of a two per cent solution of sodium citrate may have to be taken in the syringe before puncturing the vein to prevent coagulation of the blood inside the instrument.

Tuberculin injections. In non-tuberculous subjects, in jections of minute but gradually increasing doses of tuberculin have done good in several cases of intractable asthma. It is given subcutaneously one injection per week. Active tuberculous infection should always be excluded while treating by this agent. I have tried this treatment in a few cases with some success.

Antiallergens—"In 1940 Halpen proved the antihistamine action of *antergan*. "In two thirds of cases of alimentary urticaria it was useful, *Neoantergan* was better still, and was found useful in asthma, urticaria, some cases of acute eczema etc.[19]

Recently Lertigon[20] (P.D.) azoprotein complex, based on the hypothesis that histamine released from tissue cells

17. Vaughan, (1932), Jour. of Lab. and Clin. Med. 18.
18. Libman and Bigland, (1937), Brit. Med. Jour, i, p. 62.
19. Foreign Letters, Paris. Jour. Am. Med. Assoc. (1945 Dec. 22) p. 1219.
20. Fell, Rodney and Marshall (1943) J. Immunol. 48: p. 237 and Ibid 47 p. 251.

by an antigen antibody reaction plays an important part in anaphylaxis and allergy, has been found useful in allergic states failing to respond to routine methods, specially useful in contact dermatitis, abnormal sensitiveness to heat and cold, or light. It is injected subcutaneously every 4 to 5 days commencing from 0.05 to 0.1cc., useful also in migraine, asthma, eczema, urticaria, vasomotor rhinitis etc.

Benadryl (B-dimethylaminoethyl benzhydryl ether hydrochloride) (P.D.) supplied in 50 mg Kapseals or for children 10 mg in 4 cc. as an elixir taken orally three to four times a day has been found useful in many allergic states including, urticaria,[21] vasomotor rhinitis,[22] hay fever[23] serum reactions, dysmenorrhoea etc. also useful in asthma, eczema, food sensitization, migraine etc. Sedatives hypnotics should be given with caution as Benadryl itself induces sedation in some. In children the dose suggested is 2 mg per pound of body weight[24]. But it appears mostly of symptomatic value and is not strictly a curative,[25] as when the treatment is discontinued the symptoms may reappear.

General Hygiene. No stone should be left unturned to improve the general standard of health of the patient, as not uncommonly the same individual, under the stress and strain of fight in life shows sensitiveness to agents or infections, which he with-stands during the normal time without turning a hair. One has noted several cases in whom any trivial infection of the upper respiratory passages would light up an attack of asthma, hence the importance of keeping the standard of health at the optimum level. A cold bath or cold washing or sponging of the neck and throat in the morning may make the parts resistant to sudden changes of temperature.

Deep breathing with forced expiration. Some moderate form of physical labour, specially breathing exercises, with careful effort at forced exhalation by pressing the lower parts of chest[26] to increase the elasticity of the lungs, are of value

21. Curtis and Owens. (1945) Univ. Bull Ann. Arbor 2 : p. 25.
22. Williams (1945) Proc. Staff. Meet. Mayo. Clin 20 : p. 434.
23. McElin and Horton (1945) Ibid 18 : p. 45.
24. Logan (1945) Ibid. 20 : p. 436.
25. Waldbott (1946 May) Jour. Allergy St. Louis p. 142.
26. Jour Amer. Med. Assoc. (1938), Foreign letters, Feb. 5th. p. 450.

and should be tried in every case. This also tends to relieve the temporary emphysema, and increases the diaphragmatic excursion, by reducing the thorasic breathing.

A support for the lower abdomen. A support of the lower abdomen in the form of a broad belt put on early in the morning, before rising from bed and left on till going to bed, has been found of service. The other details may be seen from the previous chapter dealing with this particular question.

General health needs improvement.

During the free periods, effort should not be spared to increase the resistance of the patient and quieten the nervous paths and harden the mucous membranes of the system. For this purpose a *good vitaminous tonic* specially with adequate amounts of fresh fruits, *to supply C vitamin* liberally is of service by reducing the sensitiveness to allergens.[27] Change of climate to a place where the patient keeps well is also worth trying in proper cases. School children with asthma, may be taken to some other school where they keep well.

Medicinal Treatment to prevent attacks. The drugs of use are potassium iodide, tincture stramonium, extract grindelia liquid, spirit ammon aromat, tincture ipecac, ephedrine hydrochloride and others. Arsenic in small doses is often found useful, specially on prolonged use. Injections of sulfarsenol in minimum amounts, or soamin in one to two grains are of use, specially in Eosinophilic lung already described.

Precautions and dosage etc. of soamin. Before giving these injections of soamin the urine should be examined to exclude any albuminuria. Generally given intramuscularly once or twice a week, in one to two grains till ten to twenty or more grains are given in all. But all the symptoms of poisoning should be watched for and the drug stopped as soon as any one of them appears. Rarely neuritis and optic atrophy may follow injudicious and prolonged use of this remedy.

In some cases medinal in two to five grains with atropine in 1/100 gr. at bed time may be of benefit.

Eosinophilic lung—is treated by organic arsenicals as said already under diagnosis.

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27. Solomonico, (1936), Jour. of Immunology, Sept. p. 209.

CHAPTER XXXXIV

PNEUMOTHORAX

Pneumothorax.—Is common between 20 to 40 years of age and means air or gas in the pleural cavity. In a large majority, there is also present serous or purulent fluid, and the condition is then termed hydro or pyo-pneumothorax. Inert gas like nitrogen, when introduced into the pleural cavity, may induce serous exudate in about fifty per cent of cases. In the absence of sepsis, pleural irritation probably induces this fluid to collect.

Etiology.—The causes may be—

1. *Lung* :—About eighty percent occur from sub-pleural tuberculous cavity of more or less recent origin, or from other tuberculous lesions approaching the pleura. Old tuberculous lesions by producing fibrosis do not, so commonly, appear to cause this condition. Generally, about five per cent of all cases of pulmonary tuberculosis develop pneumothorax in some part of its course. Rupture of an emphysematous bulla,[1] pulmonary abscess, gangrene, bronchiectasis, infarct, new growths and an empyema bursting into the lung might produce it. Much is being discussed about "benign spontaneous pneumothorax,"[2] in apparently healthy, non-tuberculous subjects. Even a repeated type of this condition has been described. Air-cysts in lung by bursting out may rarely cause pneumothorax.

2. *From neighbouring Organs,* such as carcinoma of the oesophagus, stomach or from corrosives or burn etc. abscess of liver, or sub-diaphragmatic abscesses bursting into the pleural cavity or lung might cause it.

3. *Trauma or Injury.*—Wounds of the chestwall, usually produce haemo-pneumothorax. In paracentesis thoracis, artificial pneumothorax, also haemo-pneumothorax may be induced.

4. *Gas* :—In the pleural fluid as a result of bacterial activity might rarely produce it.

Pathogenesis. A fit of cough or hard physical exertion usually causes rupture which may be felt by the patient and air from the lung rushes into the patent interpleural space, having normally a negative pressure, causing collapse of the lung. The more sudden the onset and greater the positive

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1. Burrel (1937) Medical Annual (1937) p. 496.
2. Davidson (1940) Ibid p. 370.

pressure, the more acute are the signs, symptoms and displacement of the heart and other mediastinal contents. The opening when remaining patent allows air to come in and go out, the lung fails to expand leading ultimately to the falling back and contraction of that side of the chestwall. The opening, when closed, allows the lung to expand and things may be normal in a short time. But the most interesting is the valvular tear, only allowing air in, under strain of cough or deep breath, not allowing air to go out, thus increasing the interpleural pressure more and more. This form with urgent signs and symptoms is called suffocative type of the disease. Pneumothorax seldom remains without fluid collection, thus when purulent, is called pyo and when clear, hydro-pneumothorax. Partial pneumothorax, from pleural adhesion, is not very uncommon, but the so-called localised pneumothorax of old writers, as investigated by skiagram and modern methods, appears to be not so common as was suggested then.

Signs and Symptoms. These are very variable. In a big series of 500 cases collected by PEPPER[3] (1911), the onset was sudden in 77 per cent and insidious in 23 per cent, causing acute and insidious manifestation respectively.

Acute Type.. There is, as a rule, sudden agonising, stabbing or tearing pain caused by stretching of the parietal pleura. Dyspnoea may be suffocating, notably when the unaffected lung is also *tuberculous*. Shock is more or less present. The patient is "pale, expression anxious, pulse rapid and weak, the temperature falls, the extremities are cold and the body is bathed in cold sweat."[4]

Insidious cases may pass unnoticed, specially if the subject is affected by advanced pulmonary tuberculosis, already manifesting pain, dyspnoea and tachycardia. Some of these cases are diagnosed in routine skiagraphy or physical examination, or on the autopsy table.

Metallic Tinkle. This when present is a valuable sign. It is a curious musical echo accompanying breath-sound, spoken voice, or a cough or scratching of the chest wall by a nail.

Succussion Splash. Is one of the oldest signs and described first by HIPPOCRATES. The sound is produced by splashing of fluid in a resonating cavity containing air.

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3. Amer. Jour. Med. Sci. October, 1911.
4. Norris and Landis (1933) Diseases of the Chest and the Principles of Physical Diagnosis p. 725, 5th Edition.

It is elicited by shaking the patient, while the chest is being simultaneously auscultated either directly placing the ear over the chest or through a stethoscope.

Coin Test. Next to succussion splash, this is the most important test. It is best heard, when present, at the back of the chest, while a rupee is sounded by another coin transversely placed so that the flat coin lying on the upper chest is made to resound maximally. The doctor hears the metallic tinkle with his stethoscope while the coin is being so sounded.

Skiagram. The skiagram is essential to ascertain the exact state of affairs. Unlike the curved level in empyema or effusion in pneumothorax, the upper level of fluid stands in a straight horizontal line.

Exploration. Under two percent Novocaine local anaesthesia, if a stout bore sterile needle is introduced, air comes out under pressure. (For the details, see treatment.) Also exploration of the fluid may add to the diagnosis. It is interesting to note that in seven years, there were 473 autopsies on subjects dead of tuberculosis of lungs in PHIPPS Institute among these, there were 41 instances of pneumothorax making up a percentage of 8.6.[5] In these 41 cases following physical signs were positive. Coin test in 90.6 per cent; expansion absent or restricted in 89 per cent; hyper resonant in 82 per cent; bulging of the affected side in 77 per cent; breath sound distant in 52.6, absent in 18, amphoric in 15, cavernous in 7.5 and broncho-vesicular in— all expressed in percentage; metallic tinkle in 38.6 per cent and succussion splash in 31.5 per cent.

Partial pneumothortx will give signs and symptoms according to the extent, type and character of the lesion. All or a few of the above characteristic signs and symptoms may be present in such cases.

Diagnosis. This depends on all findings given above and also on the signs and symptoms complained of by the patient, skiagram, exploration, etc. Differentiation has got to be made from emphysema, tuberculous cavity, pleural effusion, subphrenic abscess, hernia diaphragm etc.

TREATMENT

Rest and Care. Whatever may be the underlying cause, the initial treatment is the same in all. If there is less severity of symptoms, all that is required is to put the patient

5. Cruice (1911) Med. Rec. Sept. 23, 1911.

strictly in bed. The lung re-expands in a few days' time. However well the patient may feel, it is extremely unwise for him to be up and about; this means great delay in the re-expansion of the lungs, and the risks of complication are correspondingly increased. If there is a valvular tear in the visceral layer of the pleura, then with each bout of cough or with deep breath, more air is drawn in resulting in an increased and pronounced dyspnoea. Hence the importance of a constant attendant for the first few days of the trouble.

For Simple Cases. The patient should be confined to bed till the lung has re-expanded. But, even after that, he should take a few weeks' rest before reverting himself to work, for ruptured bulla of an emphysematous lung in a young person the organ usually re-expands in one to two weeks' time, and the risks of subsequent tubercular infection are much.

Pain. Strapping the affected side may do some good.[8] Morphine, Atropine in ¼ and 1/200 gr. doses respectively, are often very convenient for relief of pain in an adult. Eukodal tablets or other hypnotics of the barbiturate group with Veramon or Saridan may be tried, but Morphine and Atropine are probably the best. Veganin, Optalidon or Codopyrin may also be tried for the pain, but none so useful as Morphine and Atropine.

Dyspnoea. For immediate steps, one should anaesthetise the pleura by three to five c.cm. of a two per cent solution of Novocaine and the needle of a pneumothorax apparatus put in and the extra amount of air giving rise to the positive pressure should be carefully withdrawn care being taken that the water in the manometer is not forced out by too much of positive pressure. If, after withdrawl of some air, there are indications of increased pressure, a needle kept permanently may be the only solution. Inhalation of oxygen liberated at a brisk rate through a nasal catheter may be of relief. But, in the majority of cases, there will be no pneumothorax apparatus available; under such circumstances, an ordinary stout bore needle may be inserted after local anaesthesia by Novocaine near about the fifth interspace in the midaxillary region of the affected side. So long as the extra air passes out through the needle with a sound, one can keep the needle in. But, as in the majority of cases, the

8. Lord (1927) Osler's Modern Medicine, Vol: 4, 3rd Edition, p. 309.

rent in the pleura is such that constant but further leakage of air takes place inside the interpleural space, thus necessitating the constant keeping of the needle in the pleural cavity covered with sterile guaze and fixed up by a strap of adhesive plaster. Sometimes, this needle may have to be connected with a sterile rubber tubing, the end of which lies under sterile water kept in a glass or cup. This ensures only the outlet of the air under positive pressure in the pleural cavity, and does not allow any air being sucked in inside the pleurae. These measures are, as a rule, required for a short time, say a few days, then gradually healing starts, leading to the closure of the tear and re-expansion of the lung.

Failure to Re-expand. When the lung fails to re-expand even after proper rest for a reasonable period, one should remove about four to seven hundred c.cm. of air from the pleural cavity, but the negative pressure should not be allowed to reach below 15 c.m of water, as measured by the manometer of the A .P. apparatus. If further reduced, the subjective symptoms of faintness or even grave collapse may be evident; not only this, a slight positive pressure in the interpleural space also helps in the easy closure of the tear.

Effusions in Pneumothorax. May be clear or turbid or frankly purulent. When the fluid is initially clear and tends to turn turbid subsequently, one should suspect non-closure of the tear in the visceral pleura, and the outlook is correspondingly grave. In these and febrile cases sulphadiazine and penicillin injections should be tried.

But not uncommonly, clear effusion results in A. P. cases. This may mean slight damage to the visceral pleura either at the site of an adhesion, or accidental injury during A. P. This tends to heal spontaneously.

But in cases, where the pus is purulent and the tear on the visceral pleura does not close up, the patient seldom lives for more than one year or so. In these persons, the pus should be aspirated, the cavity should be instilled with penicillin solution.

Pus in closed visceral Pleura. In cases where the tear in the visceral pleura has healed up, the pus should be repeatedly aspirated and replaced with sufficient air to leave a pressure of from 10 to 15 c.m. of water, about 40 to 50 thousand units of penicillin given per dose by systemic injections when required. The patient should be screened regularly at weekly intervals. Lavage of the pleural cavity by suitable antiseptics is also of use. If this treatment does not do much good, the help of a surgeon may be of great use. But,

opening up of a tuberculous cavity with pus is usually disastrous and leaves a permanent opening.

Subsequent Treatment. The skiagram, sputum examination and all other investigations should be made in order to come to a proper diagnosis, because the subsequent line of treatment will depend entirely upon the nature, type, degree, etc., of the original disease of which pneumothorax is but a symptom. Generally, the majority may require an anti-tuberculous regime for which the treatment of pulmonary tuberculosis should be consulted. When there is failure of the lung to expand properly, forced expiration by blowing water in WOULFE'S bottles may do good.

CHAPTER XXXXV

HAEMOPTYSIS

Diagnosis etc. In haemoptysis the underlying cause should always be determined whenever possible. It is a symptom and not the disease, hence the treatment varies according to the underlying disease of which this is but one of the manifestations.

Among the *common causes* are pulmonary tuberculosis, at its early congestive stage, later due to erosion of blood vessels, mitral stenosis, bronchiectasis, ulcerations in the upper air passages, trachea, bronchus, infarction, rarely hypertension, thrombosis, new growths of lung, trachea, rupture of arotic aneurysm etc., are common. Trauma, injury fracture, of ribs, abnormal blood conditions, infection etc., lung flukes are rather uncommon conditions particularly the latter, in India producing haemoptysis. In the tropics eosinophilic lung may cause it,[1] rupture of hepatic necrosis (amoebic) through the lung may give rise to anchovy sauce coloured sputum and may simulate haemoptysis. Syphilis, leprosy etc. may rarely give rise to haemoptysis. Hysteria is not uncommonly a cause.

Differentiation has got to be made from haematemesis In haemoptysis the history points to lung disease, the typical tickling sensation in the throat, salty taste of blood welling up in the mouth, and not uncommonly profuse in quantity, scarlet red, frothy, alkaline in reaction, may or may not be mixed with sputum. Blood may be swallowed and confused with haematemesis.

1. Mason-Bahr (1945) Medical Annual p. 322.

Sometimes, even in frank and profuse haemoptysis, the diagnosis of bleeding from the throat or liver is made. This is a bad practice and should be discouraged. Blood from the throat may only show streaks in the sputum. Whenever there is suspicion all the diagnostic aids discussed under the head of tuberculosis of the lung should be taken recourse to. Not uncommonly cases of haemoptysis of early congestion in tuberculous subjects have been allowed to advance too far with the idea that the blood was coming from the throat, or was haematemesis from liver causes. One has seen at least three cases of frank haemoptysis ascribed to haematemesis from liver trouble.

TREATMENT

Investigation etc. In the treatment of haemoptysis one should not only try to stop the haemorrhage but also ward off subsequent complications which may prove more serious than *the original disease giving rise to it.*

Next one should proceed to ascertain the exact pathological process by inspection, palpation, auscultation and from the history of the case. *As percussion may lead to further bleeding it is better not to practise it.* The heart should be carefully examined to exclude any mitral valve disease, specially stenosis. Haemoptysis due to early congestion of pulmonary tuberculosis is rather difficult to diagnose, as at this stage the signs and symptoms of the disease are generally silent. Sometimes the patient may feel from which side the blood is coming. Skiagram should be always taken and the sputum examined for full investigation.

Rest. Absolute rest in bed is the essence of treatment in all these conditions. In mitral disease, haemoptysis is generally beneficial and relieves the congestion in the lungs. Under these circumstances, other details of treatment of the cardiac condition should also be attended to. Recurrent haemoptysis due to bronchiectasis may ultimately require lobectomy. In milder cases besides rest in bed and some sedative in the form of *bromides* to relieve the excitement and fear of coughing up blood, nothing more is required.

Assurance and good nursing. As these haemorrhages are seldom fatal, *encouragement and assurance from the doctor that the condition is not serious, may help much by*

restoring confidence. A *cheerful nurse* kept day and night is of considerable help in keeping the patient in his good spirit, otherwise the very sight and idea of coughing up blood are likely to make him extremely nervous, leading to quickening of heart beat, rise of blood pressure and more haemoptysis. If the patient is of a quiet temperament and is intelligent, simple rest, a sedative mixture and reassurance from the physician is all that is generally required. Four hourly temperature charts, pulse rate etc., should always be recorded to see if there is a tuberculous basis and to assess the extent of underlying damage. In the milder cases such management is all that is required. But the danger of aspiration pneumonia or bronchopneumonia should be remembered and the patient encouraged to clear up the tubes by gentle efforts as here again straining may lead to further haemoptysis, *so coughing, notably when vigorous, should always be forbidden and checked even by opiates in extreme cases.*

The question of injection of *morphine in 1/6 gr. doses* with 1/200 gr. *of atropine* subcutaneously may have to be considered in serious cases, but the disadvantage is that it lowers the cough reflex, hence the risk of production of pneumonia by the infected material already aspirated into other parts of the lungs etc. is not inconsiderable. It is better to withhold injection of morphine in an average case, unless very urgently required, though particularly indicated in nervous individuals. Nitroglycerine 1/100 gr. intramuscularly and repeated if required may be of use.

Diet. During actual haemorrhage food should preferably be served as *cooled milk and small portions at a time* at the beginning. Not more than two pints of fluid in twenty-four hours are to be granted. The diet should better be of milk and its preparations, custard, eggs, jellies, bread and butter, fish or chicken, all served cool. But there are some observers who doubt the usefulness of serving food and drink cool.

Bowels, should be opened by a dose of magnesium sulphate in two to four drams in the morning, later, an enema on alternate days may be enough.

Calcium. Calcium in suitable form and dose may be of some effect. Injections may not be essential but in urgent conditions calcium may have to be injected. Colloid calcium with vitamin D in dram doses orally thrice daily may be used. Calcium gluconate in five to ten grains with extract parathyroid 1/10 gr. and vitamin D in 200 to 500

units, thrice daily per mouth are found useful. Calciferol, ostocalcium tablets are some of the oral remedies used for such purposes thrice daily. Vitamin K given by intramuscular injection or orally may be of use. See also vitamins, specially K vitamin in chapter on vitamins.

Rest and application of ice etc. The patient should be in bed at least for three to four days after the temperature has come down to normal. Ice to suck may not always be good and should be discouraged tactfully. An application of an ice[2] bag on the affected chest, with a piece of lint intervening, may be useful specially for nervous patients. Ice sucking may be allowed to nervous patients if it is soothing. But sucking of ice by dilating the pulmonary vessels may cause harmful effect.

Bronchitis. If bronchitis develops, proper expectorant mixture, inhalation of tincture benzoin compound, and rest in bed may be essential. Tuberculous cases may show bronchopneumonia as a sequel.

Bandaging the limbs

In severe cases, the patient should be propped up, and in profuse haemorrhage and exsanguination the limbs upper and lower may have to be bandaged in such a way that the venous circulation is obstructed but not the arterial one. All efforts of the patient should be spared and never allowed to exert himself. The room is better kept quiet, cool and no visitors allowed.

In persistent cases *inhalation of amyl nitrite which lowers the blood pressure may be tried.*

Other remedies. One teaspoonful of *sodium chloride* given orally in half a cup of water, or intravenous injection of five to ten c.cm. or more, of a ten per cent solution of sodium chloride may do some good. It is said to act by drawing tissue fluids and thrombokinase etc. into the blood, and also hypertonic effect reversing the osmosis for the time being. Concentrated glucose solution, small quantity given intravenously may act in the same way and is coagulant.

Sodium Citrate. Five to ten c.cm. intramuscularly or per vein of a four to ten per cent solution every twelve hours may be used with advantage. It acts by destroying blood platelets in the circulation.

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2. Barker, (1934). Treatment of the commoner Disease etc. p. 82. Lippincott and Co.

Congo-red[3] ten c.cm. of one per cent solution given intravenously repeated every twelve to twenty-four hours may be of service.

Subcutaneous air.[4] Injection of air subcutaneously between the two shoulder blades or at the inferior angle of the scapula at the level of the eighth to the eleventh rib, in 200 to 400 c.cm. repeated on alternate days have been very successfully used by the present writer in about ten cases of intractable haemoptysis resisting all other forms of treatment including several injections of congo red. Care should be taken to see that the mediastinum is not displaced. An artificial pneumothorax apparatus may be utilised for this purpose, or a big syringe may be useful too. The needle of such a syringe is introduced into the subcutaneous tissues and the empty syringe full of air is attached to the needle and the air injected subcutaneously. This is repeated till the desired amount is given.

Coagulants of Blood. Blood coagulants like horse serum, or haemoplastic serum, tissue extracts, neohaemoplastin, coagulen, etc. may be injected in suitable doses, and repeated every six to twelve hours with good result.

In the absence of such preparations, intramuscular injection of ten to twenty c.cm. of *whole human blood*, from one of the healthy nearest relation, may be given into the buttocks with some good. This may be repeated as required.

Artificial Pneumothorax. When the side of the chest from which the haemoptysis is taking place is found out, and the average treatment proves insufficient, or haemorrhage recurs, artificial pneumothorax appears to be the most reasonable line of treatment. In acute cases 300 to 400 c.cm. of air is required for the immediate relief. In a few hours' to two days' time a few hundred c.cm. more, may have to be repeated to increase the degree of collapse.

Results of treatment. It is very difficult to assess the value of different methods of treatment of haemoptysis, as not uncommonly it has a tendency to stop spontaneously. In fact, there is far less danger from bleeding than from subsequent spread of tuberculosis or development of broncho-pneumonia.

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3. Jour. Amer. Med. Assoc. (1935), October, p. 1228,
4. de Vega and D. C. Perez, (1935), Singlo Medico, Madrid, April 27th. p. 485.

Those in whom haemorrhage takes place by erosion of an artery in a big cavity, no known treatment, except probably artificial pneumothorax, is likely to do any good.

Mitral Stenosis. The cause of haemoptysis in mitral stenosis is, probably in a large percentage, due to pulmonary thrombosis, rather than passive venous congestion notably in the lung. The patient should be confined to bed. Digitalis in suitable doses prescribed, sodium citrate, orally in half a dram thrice daily, reducing the coagulability of blood may be of use in cases of thrombosis. Heparin and dicumarol may be also of use in thrombosis.

Bronchiectasis. Skiagraphic examination of the lungs, notably by lipiodol injection, will help in the diagnosis. If the haemorrhage is from a cavity in one of the main bronchi, artificial pneumothorax may not prove effective as it may fail to effect a satisfactory collapse. In these cases lobectomy may have to be performed. The opinion of a surgeon well acquainted in these matters may be of help.

COMMONER DISEASES OF THE GASTRO-INTESTINAL SYSTEM

CHAPTER XXXXVI

PYORRHOEA ALVEOLARIS

General and Diagnosis.

Pyorrhoea alveolaris is a chronic general infection of the supporting tissues of the teeth, leading to their eventual destruction. A suitable, but not universally approved definition is, general periodontitis (pyorrhoea alveolaris) is a chronic disease characterised by a progressive inflammation and ulceration commencing at the gum margin and invading the peri-odontal membrane, with the simultaneous destruction of that membrane. There is a rarefaction of the surrounding alveolar bone. As the supporting tissues of the teeth become destroyed, the latter become gradually looser, There is usually, though not invariably, a discharge of pus from the pockets formed by the erosion of the peri-odontal lining. Secondary changes of a necrotic character affect the cementum, dentine and pulp. In some cases the bone

changes are of a progressive rarefactive character throughout, but in other cases rarefaction may be replaced or proceed side by side with sclerosis or production of bone and fibrosis of the gum, so that the teeth remain firmly implanted until a relatively late sage.[1]

The exact causes of onset of this disease are though not very certain, yet conditions favouring the stagnation of food particles undoubtedly predispose to pyorrhoea alveolaris. Mouth breathing, irregularities of the teeth, dietetic factors, mostly lack of some of the important vitamins such as C, probably A and D as well, spacing due to loss of teeth, defective filling of crowns and ill-fitting plates, may singly or collectively favour the onset of the disease. Strangely enough, pyorrhoea occurs in patients in whom none of these factors are present, while conversely local conditions unfavourable to oral hygiene may be compatible with a good condition of the gums. It may be that there is some relation with this condition to the metabolism of the patient. Lime saturation[2] of the systemic fluids, as a result of endocrine unbalance, may favour the onset of pyorrhoea alveolaris, by deposition of tartar around the teeth, specially at whose base the buccal glands open.

Mouth, tonsils, teeth should be very carefully examined in every case. The infection often starts at *those teeth where the ducts of the salivary glands open, hence it is in those teeth that one expects to find pyorrhoea commencing. Two lower central incisors and the first molars should be carefully examined in early cases.* An electric torch, a wooden flat spatula, which can be burnt away subsequently after each examination are suitable for a thorough investigation. In doubtful cases a proper skiagraphic examination of the teeth-sockets and their apices may throw much light.

Common Trouble with far reaching effects.

It is of very common incidence. Streptococci in the pus swallowed either alone or along with the chewed food material, have their toxin partly neutralised and the bacteria attenuated by the hydrochloric acid secreted during the day time, but at night when the secretion of the acid is

1. Bennett's "Science and practice of Dental Surgery," (1931), 2nd Edition. Vol. 11. Chap. 30.
2. Pitts, (1934). The modern treatment of pyorrhoea etc. in Wakely's Modern treatment in general practice, p. 159.

much less, specially during sleep, they pass directly to the duodenum and creep up, and go into circulation and the bile ducts both of which may be infected causing chronic inflammation and gastro-duodenal ulcers, cholecystitis, stones etc. In their victorious march the streptococci may produce, whenever the conditions are favourable, enteritis, colitis, appendicitis etc. Chronic amoebiasis when associated with a chronic streptococcal infection of the gastro-intestinal tract is extremely difficult to treat, specially to eradicate. Foul breath, tonsillitis, chronic pharyngitis, and throat troubles are not uncommonly associated with pyorrhoea alveolaris. Systemic dissemination[3] of the bacteria may lead to many complications for the details of which the chapter on septicaemia should be seen.

Absorption of toxins from these areas, vary according to the local reaction and resistance of the patient, some are able to form barriers, in others chronic sub-infection and toxaemia, lead to progressive anaemia and slight pyrexia. Predisposed susceptibles may develop non-specific infective arthritis, commonly classed as rheumatoid arthritis, fibro myositis of various types, such as lumbago, neuritis, arthritis etc., specially these are quite common. Chronic eczema, urticaria, and other states of instability of various systems of the body are not infrequent. There are digestive disturbances, metabolism is affected, as is shown by the improvement of diabetes-mellitus and gout when pyorrhoea alveolaris in the patient is properly managed. The big sympathetic area, namely the splanchnic region being in a state of sub-infection the patient usually shows variable degree of neurasthenia and mental unbalance accompanied with some grade of peevishness. The mental outlook is not uncommonly pessimistic and narrow. If carefully examined, one almost invariably finds in these cases a painful gall-bladder and a caecum which is uncomfortable, if not tender, on pressure. There are numerous other minor complications which result from the chronic septic processes enumerated above. This condition is discussed in such detail because of the far-reaching ramifications of serious type caused by this apparently trifling and often uncared for serious but common disease, which is a prolific source of very slow, sometimes imperceptible undermining of the health of an individual.

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3. Okell and Elliot, (1935), Lancet, p. 869.

TREATMENT

Since the destruction of the periodontal membrane and the bone around, constitutes the essential lesion in this disease, complete cure which means reformation of bone and a re-attachment of the periodontal fibers is not only unlikely, but the utmost, one can get done in these cases, is to try to arrest the process. But when an initial gingivitis precedes the attack of pyorrhoea proper treatment as indicated by this inflammation, may do much, but unfortunately not always very happy results follow treatment even at this early stage.

MECHANICAL

Removal of the tartar.

The teeth should be scaled thoroughly, specially the portions hidden under the gum margins, unless this is done the results of treatment are as a rule unsatisfactory. To get effective scaling a mere removal of the obvious masses of tartar followed by polishing of the teeth are useless. No places should be left where pus and the bacteria may remain hidden.

Massage of the Gums.

This may conveniently be done by the fingers, viz., the thumb and the forefinger. A piece of muslin wrapped round the index finger, and soaked in a solution containing about ten to twenty grains of tannic acid in an ounce of glycerine, serves this purpose very well. The gums should be vigorously rubbed, both transversely and vertically and on both the surfaces inner and outer. This should be repeated twice a day for a few minutes each time. After about three weeks' treatment by massaging with tanno-glycerine, one may change to one containtaing one tea-spoonful of salt in a tumbler of water. *This solution should be used by the patient for the rest of his life in massaging the gums twice daily, early in the morning and the last thing at night. It acts by producing better local circulation and promotes fibrosis of the gum-margins.* It is sometimes surprisingly quick in its beneficial effects. In an average case in two to three weeks time the tendency to bleeding ceases, the tenderness becomes less, the gums lose their dark congested appearance, and the teeth may even be somewhat firmly set. Those who want to keep their teeth firm and healthy should always practise this, besides brushing and following the other details. Massage of the teeth with indigenous

common salt and mustard oil helps in the cleansing the gum margins by exosmosis, thus pus is quickly drained out, and may be of definite value in poor rural people who cannot always afford brushes etc.

Mouth washes etc.

The teeth should be brushed clean with a hard tooth brush and some suitable paste or soft soap. The brush has the advantage that it reaches the inner crevices of the teeth, which the indigenous stick brushes (Daton) cannot always accomplish. Gargling the mouth with one in five solution of hydrogen peroxide in water, specially before retiring to bed may cleanse the pockets of pus. In bad cases specially where there is sepsis present, after brushing thoroughly, a *two to four percent solution of mercurochrome in distilled water may be carefully applied to the teeth by a swab with benefit.*

Numerous solutions, pastes and washes have been advertised and advocated from time immemorial, but they have not stood the test of time. Only proper cleansing and the application locally of a dependable antiseptic are all that is required besides the above indicated lines. *If there is pain* in the teeth one may apply a local application like the following.

Tincture Aconite	m.	120
Tincture Myrrh	m.	120
Creosote	m	30
Liquor Iodine	upto fl. oz	1

to apply to the teeth as directed.

In cases where mercurochrome solution is not available, equal parts of rectified spirit and tincture iodine may be applied to the teeth with some result. Though there is a group of dentists who are against the idea of applying iodine to the teeth. While applying these antiseptic solutions, an ordinary swab is quite suitable, but for proper application to the upper set the patient should better lie down, otherwise the antiseptic lotion does not infiltrate effectively, to the roots, the affected parts of the teeth. Diluted tincture of iodine is a little painful and often gives smarting to the gums, whereas mercurochrome solution is painless.

If there is frequent bleeding and the teeth not very strong, after cleansing by brush etc. and massage of the gums, one may gargle the mouth with a twenty five per cent solution of alum. When there is foul breath due to pyorrhoea the mouth may have to be cleansed several times a

day. Listerine, pasturine etc. are proprietary mouth washes which give a sense of cleanliness to the mouth. But the essence of all this is to keep the teeth clean, and try to render the gums as free from the pathogenic microbes as possible by the local application of some dependable but non-corrosive antiseptic solution. Alkaline mouth wash at *bed time is of use when the oral secretion is acid. Milk of magnesia is advocated by some for this purpose.*

Vaccine therapy.

This is of more use in cases where some symptoms of toxic absorption such as arthritis, neuritis etc. are present. Intestinal symptoms may show amelioration when an auto-vaccine from the pus obtained in the gums, combined with the intestinal streptococci etc. is used. But not uncommonly milk protein or stock vaccines or other protein shock therapy may be of of some effect. How far beneficial local action may be produced by vaccine therapy is doubtful.

Extraction.

To decide which of the teeth need extraction, one should see the amount and nature of destruction of bone around, by clinical and radiographic examination of the affected area. Apical abscess, or marked periodontitis with pus formation and other similar irrecoverably damaged states, indicate extraction. The opinion of a competent dentist is useful for these purposes. But there appears a general tendency to extract the teeth without very sufficient justification.

General measures.

Unless a whole-hearted co-operation of the patient is there, the best efforts of the doctor will be of no use. The cleansing, massage, mouth washes, local application of the antiseptics are often neglected as the condition improves, with the result, that the patient in the next visit is in a much worse and sometimes in an incurable or very difficult situation from the standpoint of the doctor.

It is sometimes paying, specially in the long run, to make the patient understand that pyorrhoea alveolaris is a chronic intractable infection which unless very persistently and vigilantly treated and cared for, during the rest of his life, there is not much good effect expected out of treatment. This is a condition in which it is very easy to bring about some improvement but it is extremely difficult, unless the patient co-operates and is alert, to maintain this for any length of time.

No stone should be left unturned to improve the general standard of health of the subject, who is not infrequently constipated, and lives on an unbalanced dietary. Vitaminous diet or suitable tonics, iron, arsenic, nuxvomica etc. may be of use in these directions. A, C and D vitamins should be adequate in his daily diet. The bowels should be regulated preferably by fruits, or vegetable laxatives like "trifola" water, bael or papita etc. Physical exercise in the open air, proper chewing of the food, washing the mouth and cleansing the teeth after each big meal, specially before retiring to bed are good practices which every person should be made to acquire from childhood, and this may prevent much of ill health and miseries of after life. Taking of plenty of fresh fruits, eggs and milk, appear in actual life, to be good preventive of pyorrhoea and decay of the teeth.

Surgical treatment. Various sorts are of use, gingivectomy and excision of pockets of pus are simple, but reflection of the gum and curettage of bone are rather elaborate operations.

Electrical measures, such as zinc-chloride, or iodine ionisation have been advocated. It should be done by those who are well versed in giving this form of treatment.

Prevention, careful cleansing of the teeth by brush etc., specially before going to bed at night, regular massage of gums, twice a day, chewing of fruits after carbohydrate meals, plenty of fresh fruits, egg, milk, butter, that is, a diet containing abundance of A, C and D vitamins, avoidance of constipation and so on are probably preventive to this condition. Caries of teeth, mouth breathing etc. should also be rectified.

CHAPTER XXXXVII

STOMATITIS

General. These are particularly common in debilitated ill nourished children, reared, more ro less, under unhygienic conditions sometimes on unsuitable dietary. During dentition, acute specific fevers, these oral troubles usually first appear. There is almost invariably associated with it some gastro-intestinal disturbance. Rarely adults who are debilitated due to any cause may be affected.

Catarrhal or Simple and aphthous Stomatitis. They may be considered together. The buccal mucosa may partly or completely be involved. It looks red and swollen, sometimes even angry looking. The patient refuses hot or acid food or drink. There is usually an excess of secretion, in contrast to the dry mouth of thrush.

TREATMENT

All care and attention should be given to proper oral hygiene. The teeth, tonsils and the gastro-intestinal system require proper management. The underlying cause of debility such as *improper diet, avitaminosis, enteritis, acute infections, and such other factors*, should be properly remedied. In adults excess of alcohol and tobacco should be stopped. In cases of constipation or diarrhoea, an effective morning dose of castor oil may be useful. The mouth, if very sore, should be cleansed every few hours, specially after each fed, by a swab dipped in boro-glycerine. A two to four per cent glycerine solution of potassium chlorate may be applied locally every two to four hours. In aphthous variety; a thorough initial cleansing by either hydrogen peroxide or five to ten per cent solution of collargol in aqua distillata may be required. These initial cleansing applications are of value in cases of much pain indicating very acute inflammation.

Orally one may give the following in tea-spoonful doses to young patients thrice or four times a day after food with good result.

Potassium Chlorate	gr. ½ to 1
Syrup Orange	upto m. 60

If there are spirochaetes in abundance in the aphthous form, some workers advocate local application by a swab of 0.3 g. of neosalvarsan solution in 2 c.cm. of aqua distil, or one per cent solution of copper sulphate in glycerine. Small doses of pulv rhei and soda bicarb with nux vomica may be useful by improving appetite and promoting assimilation, thus raising the systemic defence. Local use of penicillin and Sulphonamides may improve matters.

Thrush. Unclean feeding bottles may initiate this infection caused by oidium albicans notably in debilitated, under-nourished children. The nurse or the mother may mistake the small pearl-white patches on the tongue and on the mucosa of the buccal cavity as curdled bits of milk, but when they coalesce and form into patches, or when the

superficial membranes get detached, frank ulcers may appear. They may spread down the oesophagus.

TREATMENT

The mouth should be kept clean, notably after each feed by boro-glycerine or some other suitable non-irritating mild antiseptic. The feeding bottles should be kept clean and sterilised by boiling and immersed under previously boiled water and well-covered. The general health of the child should be improved *by high protein and vitamin rich diet* such as fresh fruit juice, eggs, butter, cod liver oil etc. Open air life is good. *Iron, arsenic, nux-vomica,* etc. may prove of some effect. Before starting treatment the mouth might have to be cleansed even under a general anaesthesia, notably in very painful states. An application like the following may be used liberally with some good.

Sodium perborate	gr. 60
Glycerine	upto one fl. oz

Some workers think potassium chlorate in half to two grains orally thrice daily, to be specific and worth a trial.

Gangrenous or Severe forms of Stomatitis often called *Cancrum Oris*. Subjects are young persons, children, or adults debilitated through various causes, of which Kala-azar, measles, splenomegaly are common. It starts by producing necrosis of a small area, which spreads rapidly. The mischief goes on usually inside the cheek, the outer skin looks red, swollen, hyperaemic. The centre of the affected area becomes black, and if not properly treated may gradually slough out, leading in case the patient survives an attack, to hideous scars. Toxic symptoms such as fever, pain, restlessness, quick pulse etc., are common. Anaemia and leukopenia are often characterised by their presence and may be pronounced.

TREATMENT

This should be energetic and prompt. The disease is treated both by improvement of the systemic resistance and also by local antiseptic measures. Locally gargles of Condy's lotion and touching the parts with carbolic acid on a swab though have been advocated yet in most of the cases gargling of mild antiseptic or oxidising lotions like Condy's, potassium chlorate solution or listerine and such like preparations with methodical treatment to raise the general standard of health have done good in the majority of

cases. The improved resistance is of greater value than the local treatment. Injections of penicillin are very useful. See also cancrumoris in kala-azar pages 113,114 etc.

Diet. At the painful state, it should mainly consist of milk, enriched by butter and beaten eggs. Fruit juice, eggs, may be useful to raise the systemic resistance. *Suitable iron rich vitaminous tonics* specially rich in A, B and C, are of value. Iron, arsenic, nux-vomica, regular, bowel movement, proper protein and vitamin rich diet are definitely useful. If there is much anaemia, injection of some dependable brand of liver extract in conjunction with oral use of iron, and dilute hydrochloric acid often do much good. In leukopenia, injection of nuclein solution, better still pentnucleotide and pyridoxine may be useful. When associated with kala-azar, which made such an overwhelming local infection possible, should be energetically treated by intensive course of pentavalent antimony compounds, along with the general measures to improve the health of the patient. Most of the cases we have treated by average local gargles, the improvement of the general health in the lines indicated above with good effect. Probably no where more than in the treatment of cancrum-oris one needs bear in mind that, it is on the raised systemic resistance of the patient, that we have to depend for a cure. Penicillin and Sulphonamides need trial in these cases.

CHAPTER XXXXVIII

HYPER CHLORHYDRIA, AND ACHLORHYDRIA

Hyper Chlorhydria

Cause etc. The commonest causes are habitual over-eating, insufficient mastication specially of raw or irritating foods or fruits, abuse of tea, tobacco or alcohol. Too big carbohydrate meals by irritation of the stomach may also induce this secretory abnormality.

Hyper secretion is also common in duodenal ulcer or prepyloric ulcer. But in duodenal ulcer[2] not only there is heart-burn but there is actual pain after food and comes at

1. Apperly, (1936), Lancet, i. p. 5.
2. Kark and Davis, (1636), Guy's. Hosp. Rep. 86: p. 497.

regular hours, tenderness is usually constant. There is hypertonus[3] and quick emptying in duonenal ulcer. In early stages of cholelithiasis and appendicitis hypersecretion is not uncommon too.

The main symptoms are heart burn, that is burning sensation in the epigastrium, often associated with a similar sensation behind the sternum. There is almost, as a rule, regurgitation into the pharynx of a small quantity of scalding sour fluid. Usually the sensation begins two to three hours' after meals and is relieved by alkalies, water, or food. Vomiting of a little intensely sour bitterish fluid may relieve the condition. The appetite is generally good but constipation is almost the rule. Often there is excessive salivation in some cases.

DIAGNOSIS.

Examinaion of test-meal is one of the safe means of diagnosis, from gastric or duodenal ulcer, gall stones, and chronic appendicitis, before regarding it as uncomplicated secretary hyperfunction.

TREATMENT

Treatment should consist first in removing the exciting factor wherever possible and proper neutralisation of the hyper-acid state of the stomach contents.

For the second purpose, fats which tend to inhibit gastric secretion should be given, proteins whose combining power with hydrochloric acid is well known, should also be included in the dietary.Carbohydrates stimulate acid secretion and hence should be allowed as little as possible. The most important articles of diet are, milk, cream, butter, cheese, chicken, meat, fish, eggs, etc. Olive oil is a good remedy to neutralise this hyper-acidity. But milk is a good natural antacid.

Meat extracts, pickles, vinegar, unripe fruits, mustard, hot and spicy preparations, effervescing drinks, alcohol, abuse of tea, tobacco etc., should always be either avoided or taken in great moderation. A powder like the following acts as an antacid. The action is through its various ingredients.

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3. Campbell and Conybeare, (1924), Ibid. 74: p. 354.

Pulv creta aromatic	gr.	60
Bismuth oxycarbonate	gr.	60
Ext. Belladonna Siccum	gr.	4
Potassium Bromide	gr.	60
Magnesium Carbonate Ponderosus	upto oz	1

one level tea spoonful when the heart-burn is unpleasant or painful, but this should not be taken too frequently. The laxative effects of the magnesium carb ponderosus besides its antacid properties make this prescription of use, notably because constipation not uncommonly is one of the major factors in giving rise to this improper secretory activity. In milder cases olive oil in half to one table-spoonful, at the height of the pain or heart-burn, and a dose of a mixture containing tincture belladonna, m. six, potassium bromide gr. ten, for an adult, may do some good by inhibiting the gastric hyper-secretion. For the details the chapter on gastro-duodenal ulcers may be seen.

General Measures. The patient should chew his food well. The abdomen needs be protected from getting chilled. Cold feet or sensation of cold on the skin may aggravate this condition by reflex secretion. Constipation is an exciting factor and should always be avoided by either simple laxatives like "trifola water" better milk of magnesia etc. Over-eating, improper diet, are bad. Hurry or excitement during or after meals is injurious and should always be avoided. After meals the patient should, wherever possible rest in his bed on the right side for a few minutes to an hour.

Further investigation. If the above lines of treatment do not improve matters, skiagraphic investigation of the gastroduodenal tract is imperative. Fractional test meal also should be done to see the real state of affairs underlying and to ascertain the type of the hyper-secretion. Regular washing out of the stomach with one pint of one percent sodium bicarbonate solution may be useful.

Hypochlorhydria or Achlorhydria

Relative or absolute deficiency of hydrochloric acid is common, particularly the former. Oliver and Williamson (1934)[4] and others[5] bring out the following facts after reviewing the subject.

(1) Achlorhydria may occur in apparently healthy persons, but is rare in them when are completely healthy.

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4. Quart. Jour. of Med. , (1933), 2 : July, p. 431.
5. Medical Annual, (1933 and 1935), Achlorhydria.

(2) More common in women than in men.

(3) May be the fore-runner of ailments to be developed later on, such as cancer etc.

(4) Achylia gastrica, which means complete absence of all gastric secretions, in contradistinction to achlorhydria is rare except in cases of pernicious anaemia.

(5) Though commoner in later life, children may inherit the tendency of achlorhydria from parents.

(6) Common in debilitating conditions such as tuberculosis, chronic colitis, malaria, also with functional neurasthenia, flatulence, bowel irregularity, debility, slight anaemia, disturbances of the tongue. In organic diseases of the gastro-intestinal tract like chronic gastritis, gastric or intestinal cancer, colitis, dysentery etc.

(7) Severe pain resembling that of ulcer of the stomach may be due to achlorhydria.

(8) It is common in chlolecystitis and liver diseases.

(9) Very common in pernicious anaemia, though there is doubt if this occurs at all in coloured people.

(10) In hyper and hypothyroidism, diabetes mellitus, it is common too.

(11) Very frequent in subjects of rheumatoid arthritis, specially who show diarrhoea, glossitis and anaemia.

(12) Pretty frequent in allergic diseases like asthma, migraine, urticaria, dermatoses, psoriasis, chronic skin diseases, and suppurative processes.

Napier and his co-workers[6] (1938) working in the hospital for Tropical Diseases Calcutta, find that achlorhydria is no. so common in Indians as is supposed. He concludes that the current belief that compared with Europeans the Indians have less hydrochloric acid secretion is not justified by experimental data. In a group, they find Europeans, Bengalis. Punjabis are in order of the grade of acid secretory activity. All the Bengalis were mainly rice eaters. They think achlorhydria to be less in comparison with that encountered in Europe and America. Women are more commonly affected. Anaemia shows achlorhydria as in other countries.

6. Ind. Med. Gaz. (1938), Feb. p. 65,

TREATMENT

The above long list appears puzzling. But in actual practice one has found that the big list is quite justifiable, specially when one thinks of the good results in a small percentage and fair result in a good percentage of the above cases, derived by giving suitable doses of acid per mouth.

The treatment consists in exhibiting the following remedies in the way directed.

Glycerine acidi pepsin	fl. oz. 3
Acid hydrochloric dilute	upto fl. oz 4

One teaspoonful in a feeding cupful of water in sips after or before the principal meals. The associated anaemia demands treatment by big doses of iron and other remedies discussed under the anaemias.

On actual experience one may suggest that acid treatment of the gastro-intestinal tract for all conditions of debility is likely to be rewarded as a rule by gratifying results, and is always worth a trial, specially if there is any associated anaemia.

CHAPTER IL

NERVOUS DYSPEPSIA

(Gastro Intestinal Neuroses)

There are many nervous and neuropathic people mostly female,[1] who pay far too much attention to slight discomforts associated with the digestive process and develop fear of disease and obsessions about the effects of various articles of diet. A psycho-neurotic[2],[3] basis, on which gastro-intestinal symptoms are easily grafted, may be hereditary or acquired. They not uncommonly, scrutinise their excreta and make fuss without reasons. They often complain of discomfort, flatulence and lack of appetite.[4] Such patients will complain of most easily digestible foods not agreeing with them. They generally show tachycardia, clammy hands and feet. In the more neurotic persons, there may

1. Ryle, (1936), Lancet, ii, p. 893.
2. McInnes, (1937), Proc. Roy. Soc. Med. 30 : p. 895,
3. Morgan, (1931), Functional disorder of the gastro intestinal etc. Lippincot, Phila. p.p. 259.
4. Brown and ohers, (1932), Anorexia Nervosa, London, Deniel : p. 63.

be nervous vomits, aerophagia, regurgitation of stomach contents etc. It is imperative that all other organic diseased conditions should be excluded by a thorough and impressive physical examination, before they may be labelled as functional. Radiographic investigation, examination of stool for parasitic and protozoal infections, testmeal, blood examination to exclude anaemia and achlorhydria are also important.

Treatment. This consists in modifying the somatic nervous basis. Dietetically it is better to start initially with small quantities of milk every two hourly no other food being allowed in between, then gradually full diet is reached by a slow building up process. During this time proper psychotherapy and re-education are to be taken resort to also. After a very careful and scrutinising study of the patient, including skiagraphic examination, the doctor should explain things frankly to him. One should assure the patient that his fears are unfounded. The importance of the improvement of general health, and a hygienic living should be impressed upon. Such re-assurances are important and may have to be repeated frequently.

As most of these subjects are under-nourished, the general standard of health needs be raised by proper diet, exercise and rest.

The following appear important.

(1) Correction of the unbalanced diet. Fats, proteins and carbohydrates in proper proportions, with adequate amounts of vitamins, fruits, milk, egg, whole-meal bread, butter, fresh fish and good meat are of value. If there is much gas formation or putrefaction, sour milk, "Dahi", lactic acid bacilli may prove useful. (2) Rest, both mental and physical after each meal, lying on the right side for sometime, say an hour to half an hour may be of advantage. (3) The food should be chewed well and time taken over meals. Quick eating is often rewarded by dyspepsia and indigestion. The stomach should never be allowed to be overfilled. (4) The patient should be induced to take some physical exercise, walking, swimming, deep breathing with massage, specially of the abdominal muscles, to increase their tone and thus avoid constipation, are of service. For relief of constipation ordinary 'trifola' water 'ispaghula' or in bad cases a prescription like the following may be of some good.

Liq Ext. cascara sagrada	m.	60
Tincture Belladonna	m.	5
Potassium Bromide	gr.	10
Syrup orange	m.	60
Chloroform-water	upto fl. oz.	1

one dose twice or thrice daily. Remedies of use are belladonna, bromide, and cascara group. Some dilute hydrochloric acid and pepsin for protein indigestion as mentioned under achlorhydria, and five to ten grs. each of taka-diastase, pancreatin and lactopeptine after meals in cases of carbohydrate dyspepsia may be of use.

Though achylia gastrica[5] is rare yet achlorhydria is not uncommon and acid and pepsin after food are of value under these circumstances. There may be associated with such achlorhydria, chronic gastritis, anaemia, infections, neoplasms, diseases of the biliary passages, and treatment of these conditions is essential to bring about a complete cure. Big doses of ferri et ammon citrate followed, after meals, by acid or pancreatin combination may be of greater efficacy in cases showing anaemia, than these digestive drugs given without iron. Injections of liver extract may be of service in refractory cases of anaemia.

OTHER FORMS OF DYSPEPSIA

There are numerous other forms of dyspepsia and they may require different lines of treatment. But in short the above lines of management with required modification to suit the circumstances are all required. But one should bear in mind while treating these cases the fact that now a days we do not "catch our rabbit to eat the stew." There are paid men or ladies in the household doing their maximum to satisfy only the tongue, not uncommonly at the expense of the interest of the whole of the gastro-intestinal tract. Acidity, heart-burn, dyspepsia, constipation etc., are common. One should try to take lesson from the life of the animals who live freely in the open air under natural conditions. They have got to catch their prey in order to devour it. The *importance of physical exercise* is no-where more forcibly impressed as is done by the examples of the wild animals. They suffer seldom from dyspepsia, because they work much and eat less.

5. Ginsberg, (1932), Jour. Kanas. Med. Soc. 33: p. 360-363.

Mental and diet.[6] Importance of a change of surroundings and that to be more effective to a more cheerful bracing place may improve dyspepsia materially. The quality and the balancing of the diet also are of importance too. Animal proteins are far easily digested than carbohydrates and fats. B vitamin is of special use.

In anorexia nervosa the best treatment consists in explanation, reassurance and firmness. Recently insulin injections[7] to cause a craving for food are being given with promising results.

CHAPTER L

GASTRITIS; ACUTE & CHRONIC

The signs and symptoms vary from a mild acute catarrh to a severe purulent or phelgmonous gastritis.[1] The most frequent causes are dietetic errors on the one hand, and toxic or infectious conditions, febrile or afebrile on the other. All acute general infections, cholecystitis, appendicitis, gastric crisis of tabes, or an attack of angina pectoris or coronary thrombosis, may simulate an attack of acute gastritis. The recent idea as to the relation of pernicious anaemia, cancer[2] to gastritis is coming into prominence. Gastroscopy[3,4] as a means of diagnosis is now more commonly used than before.. Skiagram, test meal and other examinations are more advantageously employed for chronic states than for the acute condition.

TREATMENT OF ACUTE CASES

In acute gastritis with temperature or when in association with acute infections, the patient should be confined to

6. Blotner, (1934), New Eng. Jour. Med. 211 : July 19, p. 103.
7. Pitfield, (1935), Med. Record, 141 ; April, 3 : p. 328.
1. Lukens, (1933), Jour. Clin. investigation, 12; p. 181-192.
2. Tidy, (1936), Medical Annual, p. 211.
3. Benedict, (1935), New Eng. Jour. Med. Boston 121 : March 14; p. 468.
4. Schindler, Ortmayer, & Renshaw, (1937), Jour. Amer. Med. Assoc. Feb. 6 : p. 456.

bed, warmth and a binder applied on the abdomen. One of the natural curative agents is emesis, and is only an effort to get rid of the deleterious products from the stomach. If emesis is likely to do good, the patient may be given a pint of warm saline with a dram of sodium bicarbonate in it to be drunk off and this generally promotes vomiting. When there is much congestion and pain in the stomach after emesis, the patient may be given a stomach wash with ten grains of zinc sulphate in one pint of saline. When there is also involvement of the intestines as indicated by pain, griping and discomfort over the abdomen an ounce of castor oil repeated as indicated, may improve matters by clearing the gut of the irritant materials, specially in cases of food poisoning and so on. In bad cases with intense pain etc., morphine and atrophine in ¼ and 1/100 to 1/200 gr. respectively, more or less according to indication may have to be given. Eupaco or eukodal tablets may be useful in relieving the pain. The patient should be asked to give complete rest to the stomach for one to two days and take only small sips of water, barley water or other warm non-irritating drinks. Even lemonades, cold drinks etc., may increase irritation and delay the recovery. Once the acute stage is over milk diluted with barley water or some such cereal water, sipped when warm, may be soothing. Orally chlorodyne in ten to thirty drops or tincture of opium in two to five drops may be of use when the pain and discomfort are pronounced. But these analgesics which tend to cause constipation should preferably be given after the gut is cleared out of the irritants by either a preliminary dose of castor oil or mild saline purge.

On the second or third day, gruel, milk, soft boiled egg and toast may be permitted, and a few days later a normal diet consisting of soft rice and ordinary curry of live fishes without spices and fat may be added. Hot and irritating food should be avoided as far as possible, even after recovery. The factors which induced an attack should be remedied.

CHRONIC GASTRITIS

Chronic. In the treatment of chronic gastritis the most important item consists in avoiding those irritants which gave rise to the trouble. This may be due to abuse of tea, tobacco, oral sepsis and pyorrhoea alveolaris, irritation of

food and so on, which should demand a thorough investigation in view of proper treatment. Change to a better, dry, milder climate from a too hot or cold one may be of use. The bowels should always be kept well regulated.

Diet. All irritants either mechanical, thermal or chemical should be carefully avoided. In the chronic stage non-irritating bland articles of food should be taken and chewed well. Coarse particles, too cold or hot, highly spiced or fried or too sweet articles are to be avoided. *In cases of gastritis due to portal congestion* blue pill at night followed by salines in the morning are of use.

In bad cases with hyper acidity the following mixture may be effective.

Liq. calcis Saccharatus		
Liq. Bismuth et ammon	aa m.	60
Tr. Rhei Co.	m.	30
Syrup Auranti	m.	60
Tr. Card Co.	m.	10
Aqua Chloroformi	ad. fl. oz	1

one tablespoonful before or after each meal.

In cases where there is deficiency of hydrochloric acid as is expected in chronic cases, a mixture containing fifteen minims of acid hydrochloric dilute with the rest of glycernum acid pepsini upto one dram diluted in a cup of water in sips after the two principal meals may help materially. In carbohydrate indigestion, five to ten grains each of pancreatin, lactopeptin and takadiastase after meals may do some good.

If there is too much of mucous in the stomach as shown by excess of it in the vomited material or by test meal, washing the stomach with weak solution of sodium bicarbonate, say one tea-spoonful to a pint of warm normal saline, or one to two tea-spoonfuls of hydrogen peroxide to a pint of normal saline, may be utilised for the lavage or washout of the stomach once a day before breakfast, with good results. Failing this the patient may be made to drink a glass of warm water with a pinch of sodium bicarbonate in it. This when vomited out automatically washes out the stomach.

Avoid chilling. The abdomen should be kept covered by some suitable covering material, because local chilling is bad for acute as well as chronic gastritis.

Constipation, should always be avoided by suitable laxatives of which castor oil is one of the best. Strong or irritant purgatives are not suitable.

CHAPTER LI

GASTRIC AND DUODENAL ULCER

It appears that these conditions are more frequent, now in Bengal at least than they were about a decade or so back. Now we know that it has got relation to increased hurry and bustle of modern life[1] and its associated constipation, poverty, improper dietary, avitaminosis, greater worries, diathesis and anxieties etc. and that they do play some part in the greater incidence of these pathological processes, there is hardly any doubt, but how far a part these individually play none can say yet. Excess of tea drinking is a[2] definite contributory factor.

These ulcers are more common in both the sexes more in males between the ages of twenty to forty years.[1] Duodenal ulcers are about five times more frequent in comparison with gastric ones. One should differentiate duodenal from gastric ulcers[3] by signs symptoms, x ray, test meal etc.

The most constant symptoms in both these conditions are enumerated above, but besides there may be gaseous eructations, nausea, heart-burn, constipation and others. Sepsis in the teeth, tonsils, gall bladder, appendix, lungs or in other sites may be found in association and are the important contributory factors. In duodenal and prepyloric ulcers, fractional test meal, shows acid curves of a climbing type. Occult blood, encountered repeatedly in the stools on a proper dietary and when bleeding from teeth gum etc., are excluded, in the absence of cancer is highly suggestive of active ulcer, specially when other signs and symptoms are

1. Ogilvie (1938 June 4) Brit. Med. Jour. p. 1194; Am, year book Med. (1945) p. 624.
2. Roth and Ivy (1944 April) Gastroenterology 2: p. 274-285.
3. Hurst and Stewart (1929) Gastric and Duodenal ulcers oxford press p. 544. N. York.

present. There may be the characteristic skiagraphic findings.[4] Recently flexible gastroscopes[5] are being used extensively to visualise these ulcers, but their uses are not without dangers, unless done by experts in the line. There is some experimental work on the production of ulcers by oral exhibition of acids and other substances.[6] Food deficient in C and other vitamins probably predispose to the production of these ulcers.[7] Over the diathesis we have very little control. Recurrences are common specially during winter, due to frequent colds and infection.

The commoner *complications* of gastroduodenal ulcers are, haemorrhage, perforation, localised or subdiaphragmatic abscess, perigastric or periduodenal adhesions, pyloric obsstruction, hour-glass stomach, occasionally cancer and others.

In discussing the differential diagnosis one should think of cancer stomach, chronic gastritis, gall stones, cholecystitis appendicitis specially with a high appendix, renal calculus gastric crisis of tabes, gastric neurosis, and others. The recent paper on this subject by Ivy is very interesting[8] and instructive.

TREATMENT

As soon as the diagnosis is made, the patient should be made to rest in bed for at least four weeks. He should avoid cold and chills and keep himself warm, but may be allowed to be up and about for bathing and answering the calls of nature.

According to Ivy the principles involved in medical treatment should be[8]—"(a) physical and emotional rest, sedatives as indicated and reassurance; (b) the buffering of acid with frequent small feedings, a highly nutritious diet to promote healing and taking advantage of the inhibitory action of fat on the gastric secretions; (c) antacid medication for control of acidity avoiding alteration of body chemistry as

4. Buckstein, (1930), Peptic ulcer, clinical roentgenology. Haeber. I. N. York. pp, 337,
5. Schindler, (1935), Jour. Amer. Med. Assoc. 105: p. 352.
6. Friedenwald, Feldman and Morrison, (1933), Jour. Expt. Med. 57: p. 203-213.
7. Smith and Mc. Conkey, (1933). Arch. Int. Med, 51: p. 413-426.
8. Ivy (1946 Dec. 28) Peptic ulcer. Jour. Am. Med. Assoc. 132: p. 1053.

much as possible; (d) antispasmodic as indicated and as tolerated by the patient; (e) continuous drip of therapeutic aspiration as indicated in special cases, and; (f) removal of foci of infection."

The *prescription suggested in the next few pages* covers and satisfies practically all the principles involved above. Along with the powder milk mixture every hourly day and night, olive oil twice at 10 P.M. and 2 A.M. with both powder and milk keep the acidity neutralised for the night. Along with fruit juice and eggs when given practically satisfies the nutritive and vitamin requirements also, and thus speed up healing of the ulcer. *Pepticol*, a preparation with the added efficacy of aluminum hydroxide mixed to it, has been used by us in a fair number of cases of peptic ulcer as a substitute for the powder with satisfactory results.

Lenhartz-treatment.

His principles in contrast with those of most other clinicians, consist in upkeeping the nutrition and strength of the individual. Thus, he starts with feeding of milk and egg beaten together soon after the haemorrhage is over. He gives, frequent feeds of the above diet and uses bismuth subnitrate as the antacid. Complete rest in bed for four weeks is enjoined, and an ice-cap applied over the stomach for about a fortnight after the haemorrhage. Gradually solids, such as soft boiled eggs, soft rice, mashed boiled potatoes are added. Fats are useful and given according to indications.

Sippy[9] treatment and its modification. Consists in giving three ounces of a mixture of equal parts of milk and cream from 7 A.M. to 7 P.M. at hourly intervals. After one or two days, a soft boild egg with a cream-craker biscuit or bread and butter may be added to one of the forenoon feedings, thus gradually soft boiled rice, oatmeal porridge, one or two soft boiled eggs, one at a time, a few ounces of cereal, say two to four ounces at a time, twice daily for the first few days, to be made more frequent later on, are permitted.

A powder is given consisting of ten grs. each of heavy calcined magnesia, and sodium bicarbonate, alternating with a powder containing ten grs. of calcium carbonate and thrity grains of sodium bicarbonate in between the alternate feeds. After the last meal at night, every half an hour or so, for

9. Sippy, (1915 May 15), Jour. Amer. Med. Assoc. 64: 1, p. 1625-1630.

four to five doses of these powders are given until the stomach contains no food as is ascertained by occasional passage of the evacutor. Calcined magnesia and calcium carbonate have four, and two and a half times antacid properties respectively, as compared with that of sodium bicarbonate. Belladonna, olive oil etc., are used too.

But the recent ideas seem to show that too great proportion of sodium bicarbonate in these powders is not suitable due to its stimulating after effect on the secretions of the gastric mucosa.

Practically. All these methods have got their respective advantages and disadvantages alike. But for an average case the following modified method adopted by the writer have been found useful and suitable for employment in average Indian homes as well as the hospitals. It is less fussy and somewhat practical.

The actual process. The patient should be put to bed and the abdomen kept warm and chilling prevented by a simple binder of flannel or jute flannel, or thick linen, or sheet of cloth. Unless he is in a very bad condition or just after a severe haemorrhage, he may be allowed to go for his normal toilet etc.

He is given a powder like the following, one level teaspoonful. He may take it every hourly alternating with either milk and barley or milk, egg, and gruel or barley beaten together. Generally the proportion of milk and barley is one pint of milk to a quarter of a pint of barley water. This barley water or gruel tends to make the milk curds finer. To a pint of hot milk is added one to two raw eggs and beaten well in conditions of weak state and malnutrition in the patient. About four to eight ounces of this milk mixture is taken every hourly alternating with the antacid aperient powder, with a little water. At night too the patient should be made to get up and take the powder and the milk mixture, and 4 to 8 teaspoonfuls of olive oil at 10 P.M. and 2 A.M. along with the powder, milk mixture so that the night secretion is also neutralised.

Sodium bicarbonate	gr. 60
Menthol	gr. 6
Pulv Creta aromatic	gr. 120
Bismuth Carbonate	gr. 120
Potassium Bromide	gr. 120
Extract Belladonna Siccum	gr. 8
Magnesium Carbonate Ponderosus	ad. oz. 3 or 4

when constipated.

One is not much in favour of adding sodium bicarbonate to this powder except in small quantities on account of its acid stimulating after effect, and also due to increase in the blood of sodium ions which tend to augment the gastric juice and also for fear of alkalosis. *Peplicol* is quite an effective substitute of the above powder, on clinical trial pepticol was quite effective in almost all our cases of peptic ulcer.

Olive oil etc. Along with the powder one to two table-spoonfuls of olive oil may be given, at 10 P.M. and 2 A.M. with the powder and the milk mixture when the above treatment is not enough to combat the hyper-acidity completely. But as it is not pleasant to take, hence many workers advocate either cream or butter to be taken in suitable quantities specially at night, as during sleep when there is a likelihood of missing the milk gruel mixture and the antacid powder for some time. Olive Oil and these fats have got very pronounced acid neutralising properties and that for a longer time, than is possible by milk and its preparations.

Belladonna and Bromides. If the pain and discomfort are not materially relieved in a week's time and in those cases where the risk of pyloric obstruction is probable, one gives in addition to the above, a mixture containing about ten grs. of potassium bromide and five to eight drops of tincture belladonna every four to six hours or frequently, in addition to the above antacid powder. These are to be pushed just short of poisoning symptoms, by belladonna.

Night Secretion. In bad cases, where there is more than a few ounces of gastric juice at night, it is evacuted out by the Senoran's evacuator, and the stomach is washed twice, at night, at ten P.M. and between three to five A.M. respectively, which may prove effective. But to do this is rather difficult problem except in the hospital. In private cases most of these conditions improve under the regime discussed above, specially if the patient takes the antacid powder and the milk mixture at night and also the belladonna and bromide mixture just before going to bed. A few table spoonfuls of some suitable fat or olive oil to keep the acidity neutralised for some time and is of special use for the night, thus allowing the person some rest through sleep.

Atropine. Those who do not improve under the above lines of treatment, may require at night before retiring say at ten P.M. an injection of 1/100 to 1/60 gr. of atropine sulphate subcutaneously. This is of special use in intractable

cases showing increased secretion of the stomach at night. This often obviates the unpleasant task of washing out the stomach.

Vitamins. Vitamins A, B and C should be supplied in adequate amounts because the A factor seems essential for the upkeep of the functional activity of the epithelium of the various lining membranes of the system, and C vitamin[10] when too much deficient may cause ulcers by undue fragility[11] of the capillaries on the stomach wall by improperly nourishing the capillary endothelium. B vitamin is also important on account of its effect on the maintenance of the tone of the involuntary muscles of the intestines. Lack of vitamins in diet during Sippy treatment may show pronounced signs and symptoms of avitaminosis. Even stones in the bladder are known to have formed, hence the vitamin rich diet, such as fruit juice, eggs should be given during the whole course of treatment.

Diet. Milk is one of the best antacids and when mixed with some barley water or gruel, the curds become smaller. Eggs are more or less mild stimulants to the gastric secretion. Yet those patients who are under-nourished and weak should have two half boiled or poached eggs added to each one and a quarter pint of the milk mixture, and also should take olive oil, cream or butter in order to add acid neutralising liberal and food value to the diet. An additional advantage is the acid neutralising property of these fats when taken in suitable amounts, of one to two tablespoonfuls every four to eight hourly during the day and in the double the quantity, at half the intervals, at night, along with the other remedies or with some suitable modification.

Later on. The interval between the milk mixture and antacid powder or pepticol should be an hour to start with, but in three to six days' time, as the pain, discomfort and the local tenderness on pressure is gone, or much improved, the interval may be lengthened to one and a half hours, later to two hours or longer. After the third or fourth day or so, with the improvement of the signs and symptoms locally the patient may be allowed a piece of toast with butter, one or two pieces of good biscuits, eggs, custard, a little oatmeal porridge with bananas, some fruit juice of good type etc. By the tenth to the fourteenth day, or earlier the patient may be allowed, a little soft boiled rice with milk

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10. Graham, (1936). Lancet. ii, p. 364.
11. Lancet, (1937), Editorial, Oct. 30: p. 1029.

and bananas, but as little sugar as possible. Boiled or suitably prepared fish or in the form of stew etc., may be added during the third week. Boiled potatoes mashed, with or without fish may be allowed too in the third week. During this time frequency of the milk mixture and the powder may be every three to four hourly. Gradually the patient is allowed boiled lean meat, vegetables of soft and succulent type. He should avoid all spicy and too rich, hot curries etc., and live on a good nourishing easily digestible bland diet. *Constipation is very damaging* and should be carefully avoided by all means.

Duration. The treatment to be effective should have to be stuck to for four to eight weeks. The actual lines of subsequent action need be guided by the findings of the test-meal, skiagraphic appearance, site, position, of ulcer, signs and symptoms of the case. Duodenal ulcers, which are more frequent than gastric ones, are fortunately more amenable to antacid treatment than gastric ulcers.

Recurrences and Prevention. Probably due to the peculiar diathesis, and presence of the septic foci etc., this disease has a tendency to recurrence. All the septic foci should be removed, tonsillitis, pyorrhoea alveolaris, sinus, appendicular, or biliary infections got rid of, and constipation avoided. He should chew his food well and eat slowly. If there is dearth of time for meals, instead of taking a solid meal hurriedly, he should take milk and other preparations, which may be drunk. Alcohol, condiments, vinegar, irritating food and unripe fruits should either be altogether avoided or taken very carefully and that in strict moderation. Ice creams, too hot or too cold drinks are bad for him.

The patient should lead a well regulated life for at least two years and follow a more or less modified regime for the rest of his life. This condition has a peculiar tendency to recur during the winter months, so one should be careful particularly during that season. As soon as a recurrence is threatening, he should go to bed, keep warm, and follow strictly, the ulcer regime till definitely free from symptoms.

Alkalolis. Too much and long continued treatment by the antacid powder, may bring about alkalosis[12] in the patient, where such a danger exists, as indicated by headache, vertigo[13], loss of appetite, distaste for milk, malaise,

12. Hardt and Rivers, (1923), Arch. Int. Med. 31 : p. 171.
13. Hardy, (1928), Lancet, i, p. 834.

nausea, vomiting, drowsiness, even coma[14] (Oakley), a determination of the alkali reserve of the blood should always be done wherever possible. In the early stages the symptoms of alkalosis are usually relieved as soon as the alkalies are stopped orally. In persons with kidney disease these symptoms may prove very severe.[15]

Indications of Surgical intervention[16] are.—

(1) In cases of perforation and that at the earliest moment. Perigastric abscesses require surgical aid. (2) In case of recurrent haemorrhage which is not controlled by strict medical treatment. (3) Where pyloric obstruction with or without symptoms of active ulceration are present and the ulcer resisting three weeks active medical treatment. (4) In cases of haemorrhage in elderly people, whose blood vessels are sclerosed and associated with hypertension, medical treatment proving futile to check the bleeding, operation is the only means left. (5) When the symptoms recur after several careful medical regimes and adequate after care, an operation may be the only course left. (6) An organic hour-glass constriction causing delay in emptying of proximal segment of the stomach. (7) In cases where there is the possibility of presence of a growth, following an ulcer. But even after surgical intervention ulcers may recur in the proximal part of the small intestine joined with the distal part of the stomach.

Recent methods of treatment.

Mucin. The mucin treatment[17] is based on the princi ple that it is one of the best neutralising agents of the gastric secretion. The original preparation used was histamine free gastric mucin of Messrs. Armour & Co. It was given in tablespoonful doses dissolved in water every three hourly[18] and at night too. Casein hydrolysates, like pronutrin etc. (Herts Pharmaceuticals) are being utilised of late for peptic ulcers with encouraging results.

The basis of this treatment is :—

(1) Experimentally mucin inhibits protein digestion in vivo. (2) In dogs experimental ulcer can be cured by mucin. (3) Ninety per cent of intractable series of one hundred and

14. Oakley, (1935), Ibid. ii,, u. 187.
15. Walters, (1932), Ann. Surg. 96 : p. 258-268.
16. Jour. Amer. Med. Assoc. (1938), Editorial, April, 30 : p. 1491.
17. Amer. Rear Book of General Med. (1934), p. 706.
18. Block and Rosenberg, (1933), Amer. Jour. of Med. Sci. 181 : p. 260-270.

seventy cases were all relieved in a week's time of all subjective symptoms by this line of treatment. (4) Recurrences are very few[19] after this treatment.

Injection of Histidine Mono-hydrochloride Solution :—

Five c.cm. of a four per cent solution of histidine monohydrochloride is given by injection subcutaneously or intramuscularly, daily, till twenty-one such are given.[20] This is expected to cure a case. No dietetic restriction is required except during the first few days. Aron (1935)[21] in his series of forty two cases treated by the above method, found satisfactory result in thirty-seven. In four cases it was a complete failure and was partly so in an alcoholic subject. Twenty seven cases were examined radiologically at varying intervals after the course. In thirteen there was complete disappearance of signs of ulceration and in ten considerable improvement, in the remaining four there was no change although they were free of all symptoms. The other case was one of the failure. Gastric acidity was analysed in ten. It was increased in three, in two of which the radiological findings were normal. In ten cases the acidity had diminished to a great extent.

Sandweiss (1936 and 1937)[22,23] investigated the comparative effects of histidine injection and diet, alkali treatment. of his sixty-seven consecutive cases twenty three elected to have injections of histidine, forty-six to have diet alkali treatment. The immediate result though closely similar in the series, sudden disappearance of all discomfort in many patients, after a few injections was regarded as a striking feature. Follow-ups showed that the recurrences were much lesser in the diet alkali series than in the other group.

Hence the results of treatment by injection of histidine monohydrochloride are so conflicting that it would not be safe to use it as the sole means of treatment. It appears to relieve the symptoms more than to cure the actual ulcers.

Chlorine free diet and withdrawal of gastric juice.

Mellinghoff and Kotsche[24] (1933) showed that withdrawal of gastric juice was useful in gastroduodenal ulcer and

19. Jour. Amer. Med. Assoc., (1933), March 8 : p. 790,
20. Weiss and Aron, (1933), Presse, Med. 41 : Nov. 22 : p. 1880.
21. Aron, (1935), Ibid 43 : p. 1195.
22. Jour. Amer. Med. Assoc. (1936), 106 : p. 1452,
23. Ibid. (1937), Feb. p. 700.
24. Deut. Arch. f. Klin. Med. 175 : Sept, 14; p, 614,

gastritis. Addisin, an extract of gastric juice was found on injection, to be a stimulant to gastric secretion, conversely withdrawal of gastric juice deminished gastric secretion. They were of opinion that basal metabolism rate had some influence in producing ulcers. They wanted to remove the chloride ions from the system by a salt free diet and periodic withdrawal of gastric juice. Injections of salyrgan were given to produce diuresis and deplete salt from the system. This method of treatment appears to be of special use in cases of intractable hyper-secretion[25]

Octinum appears to be an effective antispasmodic for the gastroduodenal pain. It is available in tablet, liquid and ampoule form.

There are numerous patent remedies in the market for the treatment of gastro duodenal ulcers, but their composition and effects vary and it is not possible even to mention them. They all seem to act more or less on the principles of Sippy treatment. But it should be stressed clearly that to take any patent cure, however potent, casually will not cure a case of ulcer. Very *recently resection*[26] *of both the vagus* nerves to the stomach, has given very good result in 200 cases of peptic ulcer. But we must wait to assess its full result and consequences. Injections of *enterogastrone* has produced promising results in the treatment of chronic peptic ulcers.[27] Recently peptic ulcers are being described in persons above 60 years of age.[28]

CHAPTER LII

INTESTINAL INDIGESTION OF CARBOHYDRATES

DIAGNOSIS

Symptoms. These may be partly gastric and partly intestinal. Among the manifestations related to the stomach, such as nausea, vomiting, flatulence, sensory dis-

25. Amer. Year book of General Med., (1934), p. 707.
26. Alvarez (1946 Dec. 21), Jour. Am. Med. Assoc. 1 2: p. 970.
27. Ivy (1945) Federation Proc. 4: p. 222.
28. Keifer and McKell (1947. April 12) Jour. Am. Med. Asso. 133: p. 1055.

turbances like heaviness, pain—spasmodic or colicy, are frequent. Among the intestinal group are gaseous distension, pain, discomfort, diarrhoea. The gas collects mainly in the splenic flexure, and the patient mistaking it for gastric flatulence, often takes to aerophagy, and tries to relieve himself by belching. At times when the stomach is involved, the pressure of gas in the fundus of the stomach leads to palpitation, extra-systoles etc. Not uncommonly the intestinal flatus is passed per rectum with much noise. This gas, and, in an excess of sugar in diet, fermentative acidity, cause irritation, resulting in pain and hurrying down of the intestinal contents manifesting as diarrhoea of an acid type with excoriation of the rectum and anal region, met with particularly in children. These young patients may show paroxysmal bouts of cry which synchronises with vigorous peristaltic movements associated with diarrhoea or not. Any infection of the intestines, chronic or dormant may get flared up due to the catarrh set up by such intestinal upset. The reaction of stool in these cases of sugar fermentation is acid and is frothy and may have an acid odour.

Diagnosis.—Diagnosis may present some difficulty when other disturbances are associated, or when the symptoms are vague and indistinguishable from suggestive clinical features. An investigation into the quantity and quality of dietary, presence of granules of starch in stools, the latter turning blue by Iodine solution, are helpful. The acid stool on keeping for sometime may give out bubbles of gas. Incubation of such stool, mixed with sterile water causes some odourless gas to evolve out and the reaction if not acid before changes to acidity. In difficult or dubious cases a radiological investigation may be of help.

In putrefactive diarrhoea, resulting from insufficient protein digestion, on the contrary, the stool is as a rule strongly alkaline in reaction and is extremely offensive.

Differentiation has got to be made from functional disorder of the gastro-intestinal tract. In other functional states there is neither so much close relation to disproportionately big carbo-hydrate meals, nor the symptomatology nor investigation of stool, skiagraphic records suggestive of this point.

Colitis or entero-colitis may be associated with this sort of dyspepsia. But entirely unrelated enterocolitis is, more or less sudden in onset and is periodic, unassociated with

starchy meal, and improves under lines of treatment different from those of carbohydrate dyspepsia. Investigation of stool culturally or otherwise, and radiological findings may help.

In children, specially in acute states, the evidences are more dependable. The occurrence of mucous gelatinous acid stools, may be green in colour, having a sour or musty odour, are strongly suggestive of this condition. But there may be present an associated catarrhal enteritis.

Results of treatment carried out on their respective suggestive lines are helpful points in clinching the diagnosis.

TREATMENT

This may conveniently be divided under (1) General (2) Dietetic (3) Medicinal and others.

General:—If there are distressing symptoms, specially an *acute entero-colitis*, the patient should be in bed, and kept warm. An abdominal binder is of definite use, particularly in children and debilitated. Physical exertion, worry, anxiety delay recovery, hence should be reasonably avoided. In sub-acute or mild cases, occupation entailing less strain may be allowed to be continued.

In chronic states, particular care should be bestowed in preventing hurry at meals, and any state of anxiety such as attending office in time and so on—specially after a big carbohydrate meal. These should be avoided either by an early diet and rest following it, or the meal may be taken in the office at leisure. Worry and anxiety are bad too in chronic cases. Some form of suitable physical exercise should always be taken by these dyspeptics. All septic foci should be found out and eradicated as far as possible.

Food and drink:—In acute cases, all solid food, specially rich in starch, should be withheld. Fruits and raw-vegetables also are not tolerated well. But, juices made out of suitable fruits like orange, pomegranate, tomato, grapes, etc., are useful. According to taste and liking. whey. albumin water, diluted butter milk (ghole) useful for its lactic acid content, clear vegetable or meat soup, decoction of lentils; (musur-kat) and such like articles may be given during the acute stage. Sugar in small amounts may be allowed, at intervals, to sweeten food or drink. Milk may be granted either diluted or peptonised, when disagreeing,

1. Glasgow Med. Jour. (1936), 126 pp. 1.

it should be stopped. Sugar is as a rule bad and not tolerated well in acute fermentative diarrhoea of children. Not uncommonly one treats these cases successfully by giving a mixed diet[2] of rice, fish, eggs, fruits etc., after a morning dose of Castor oil. In some cases of grown-up children, fed exclusively on milk and other liquids sweetened with sugar, a fermentative diarrhoea of a chronic type is commonly encountered. They often respond to a reasonable diet of rice, curries, of fish and meat, milk puddings, eggs, fruit juice etc. after, a cleansing dose of castor oil emulsion. Milk of magnesia or oxide of magnesia may do good as laxatives and also are good antacids.

In chronic types of dyspepsia in adults, particularly of the clerical or intellectual profession, directions should be given not to hurry at meals. If short of time, the patient should better drink some milk or other liquids instead of bolting down hurried unchewed meals. Disproportionately big carbohydrate meals, too much for the small intestine to manage, should be reduced. One or two pieces of handmade bread (chapati) or loaf of wholemeal flour, add to the nutritive value and lessen the bulk. Wherever possible with the reduction of carbohydrates, proteins, preferably of animal origin such as fish, meat and milk preparations should be added. For the vegetarians, milk and its preparations such as milk casein, (channa), lentils etc., should have a greater share in building up the diet list. Milk is a very important article of diet and should be taken by an adult even up to one to two seers besides other articles of food. Curdled milk is useful for those who cannot tolerate pure milk, is of special value in protein dyspepsia. Milk, boiled with a little barley or suji or rice, will not produce gas; when taken pure, it tends to produce wind.

All vitamins, notably B complex[3] are of considerable importance for the health of the gastro-intestinal tract.[4]

The reduction of carbohydrates is mainly the line of treatment which not only improves the clinical picture but also materially reduces the number of enterococci present in the stools, which prolonged vaccine treatment and bowel washes, often uselessly advocated, cannot accomplish.

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2. Arkroyd (1937), Brit. Med. Jour. ii, pp. 1008.
3. Coidgill (1938), J.A.M.A. 110, p. 805.
4. Morgan and Berry (1930), Amer. Jour. of Chlid. Dis. p. 935.

Sometimes, one has noted that the starch made out of dried peeled-off green bananas is well tolerated when rice and flour do not agree with the patient.

As individuals vary not only according to their age, weight, occupation, digestive capacity etc., so also seasonal and diurnal variations in digestive capacity are noted; so, on the face of such variability, to fix up the carbohydrate ratio in exact quantity is an impossibility, but this should always be short of throwing strain on the digestive power of the patient.

Medicinal Treatment.—In all acute cases, the treatment should better start with a cleansing dose of Castor-oil emulsion or milk of magnesia. A prescription like this, may be given:

R Oil Ricini	ʒii
Pulv. Gum. Acacia	q. s.
Tinict. Hyoscyamus	m. xx
Tr. Card. Co.	m. vii.
Syrup orange	ʒ i.
Peppermint water	upto ʒ iv

One to two doses early in the morning for an adult, till effective bowel movement is got.

This mixture in effective doses should be given the first thing in the morning. For children, a fraction of the dose may be given. In deficiency of secretory juices of the intestines particularly in children, a prescription like the following containing fractional doses of Hydrarg with Creta or Subchlor, may be of use, due to the Hydrarg content which increases the intestinal and glandular secretions.

R Hydrarg with Creta	gr. ⅛
Sodi Bicarb	upto gr. ii

One powder twice daily. A grain each of Betanaphthol and Salol may be added to the above in more serious cases.

Once the intestines are cleared of the irritant materials, and the tongue is clean and there is not much abdominal discomfort, a mixed diet with reasonable proportion of all the proximate principles, rather with less of carbohydrates and fats, may be suitable. If the diet is rich in protein, one may give a dose of a mixture containing twenty drops of dilute Hydrochloric Acid, forty drops of Glycerine, Pepsin in an ounce of water to be taken after the two principal meals.

In cases of fermentative dyspepsia, associated with diarrhoea and a clean tongue, a binding powder like the following may be given :

R	Bismuth Carbonate	gr. 5
	Dover's powder	gr. 4
	Soda Bicarb	upto gr. 12

One after meals. To this, one may add ten grains each of Pancreatin and Taka diastase to facilitate digestion, notably when there is the possibility of deficiency of intestinal diastase. In deficiency of secretion of the small intestine, as a result of infection, past or present Pancreatin and Taka diastase in ten grain doses each, may be of definite use. An alkaline bitter mixture before meals often tends to increase the flow of secretory juices and thus be useful. Suitable sulphonamides may be tried in cases of diarrhoea etc. specially when febrile.

Where, inspite of reasonable treatment, excess of gas forms in the intestines, powdered charcoal in teaspoonful doses with or without Kaolin may be of symptomatic relief.

In cases with disorder of the stomach, attention should be given to that organ. Antacids may be of use. *Takazyme* (P.D.) is sometimes of use.

Vitamins in suitable forms add to the health of the gastro-intestinal tract; one of AbidolC capsules, ensures some adequacy of these vital elements. It is to be given in an empty stomach as far as possible. Compressed Yeast tablets 4 such thrice daily are good source of vitamins specially of B complex.

CHAPTER LIII

CONSTIPATION (HABITUAL)

(In Adults and Children)

Diagnosis etc.

Before establishing the diagnosis of constipation, one should try to ascertain the real state of affairs with the patient, as many neurotics, even healthy people have the idea, though without reasons, that they are constipated. When none of the material of residue of the first meal taken after defaecation, is excreted within the next forty-eight hours, the patient may, by mutual agreement, be called somewhat constipated. If no other suitable method

of ascertaining if a person is constipated or not possible, exhibition of a few charcoal biscuits swallowed before beginning the meal may serve this purpose. Each stool is inspected carefully to find out when the black one first appears. This gives one a rough and ready idea of the time taken for the contents to pass through the gastro-intestinal tract.

Usually here are two types of constipated people. Both of these groups may suffer from the important clinical condition known as dyschezia, or proctogenous constipation. Normally the urgency for defaecation starts as soon as the faecal matter reaches the lower few inches of the rectum. If this delicate natural stimulus is disregarded and the patient does not visit the bathroom, gradually this area of gut loses its sensitiveness and results in the proctogenous type of habitual constipation whose remedy lies in asking the patient to do his maximum at stool at regular hours, whether there is any urgency or not. Thus by regularly habituating the patient, the only safeguard against such type of constipation is possible.

Spastic Constipation. The subjects of this type of constipation are usually thin persons, often neurotic, complain of ill-defined areas of tenderness scattered all over, specially on the abdomen, and as a rule minutely describe their signs and symptoms.

Physical examination usually reveals a distended caecum which may be tender, the sigmoid colon feels like a cord, and there may be some degree of ptosis of the abdominal viscera. Spasms of the sphincters, haemorrhoids and fissures are common in these subjects.

The atonic type. These persons commonly have characteristics quite opposite to those mentioned under the spastic group. They are generally quiet, steady, not uncommonly obese, sthenic but anaemic persons who are rather elderly and have neglected now and then the urgency to defaecate. They have as a rule atonic abdomen. The diet of these persons is not generally quite suitable and lacks in green vegetables, fresh fruits, butter, etc. They by nature do not like to take any physical exercise and may have some disease of one or several of the organs, such as the liver, gall-bladder, appendix, pancreas; ovary, cancer, adhesions and so on, which also may complicate the situation.

TREATMENT

Before actually starting treatment the patient should be examined very carefully to exclude any organic defect,

notably bearing in mind the facts mentioned above. A skiagraphic investigation, ascertaining of the time taken for the passage of the stool, test meals, rectal examination and other investigations might have to be done inorder to exclude all organic diseases which might have caused the constipation. Though cure is a very difficult matter yet improvement is possible in the majority, if not in all cases. Regular daily timely attempt to evacuate the bowels is of imperative necessity. The patient, according to his usual habits should either do this after morning tea or early in the morning as suits convenience, urgency and so on. Regular and suitable meals are also helpful to relieve this condition.

Physical exercise. Some form of physical exercise, specially those like swimming, riding, massaging the abdomen, body and leg bending, deep breathing, and other abdominal exercises do much good by improving the tone of those abdominal muscles which aid in exerting pressure, thus helping bowel movement. The particular form of exercise in which the patient lies on his back, stretching the hands fully up by the side of the head, then alternately raising the legs, all the while the breath being held in, assists the formation of good abdominal muscles. Bending of the upper part of the trunk at the waist the toes being reached by the fingers and also raising of both the legs at the hips are of service. Deep breathing with massage of the abdomen may help to restore tone of the abdominal muscles. Physical exercise keeps the body fit and maintains, not only the tone of external abdominal muscles, but also that of the intestinal ones. The lack of any physical exercise may be at the root of many troubles including constipation.

Mental change. If there are depressive circumstances or any difficulty or any other organic trouble, only some amelioration and not cure of constipation is likely.

Diet. In the atonic cases, the diet should be so chosen that enough of residue is left to induce peristalsis at the regular hour of defaecation. *Roughage* in such diet may be of some effect. Plenty of green vegetables, fruits which are rich in cellulose and such matters, are of use for these purposes. Salads made of raw tomatoes, lettuce, beet root etc. are of service. Fruits such as apples, bananas, mangoes, papitas, bael etc., may be of use. Dried figs, resins, dates, all have slight laxative effect. Green and fresh vegetables not only help us to get rid of the constipation but are rich sources of mineral matters and are almost as useful articles

of diet as milk itself. Green papita, figs, when taken cooked serve also as laxatives. Sugar candy water with "Ispaghula" say half a glass or one cupful of the former and two teaspoonfuls of the latter may be of use in avoiding constipation. A pleasant drink may be taken during the noons of summer months of the above, soured with a little lemon juice to suit the taste of the individual. This combined drink is of much use in habitual constipation, amoebiasis etc. To drink a glass of water, each at bed time and just after leaving the bed early in the morning, may be of service to those cases where the water intake is insufficient or less than average. Those who drink plenty of water are seldom constipated. *Mineral waters* from various sources such as Vichy, Harrogate Carlsbad, Kissingen etc., due to their slight saline content mostly of sulphates serve as laxatives. Water is of special value in cases of spastic constipation. A cellulose rich diet with roughage may not be of much use in these spastic cases.

Massage and electricity. Massage of the abdominal muscles combined with electricity, like application of short Faradic currents after some active physical exercise may be of some help. But nothing appears to compare so favourably with the results of the active physical exercise such as body bending with active massage, suggested above.

Vitamins. B vitamin appears to keep up the tone of the involuntary muscles of the intestines, and prolonged lack of such an important accessary food factor may, by weakening these intestinal muscles, cause constipation. Eggs are good sources of B vitamin and may be regularly taken. Liver is also a good source. Marmite, bemax, yeast extract are also good sources of this vitamin.

Medicinal Treatment. Drugs specially of the laxative and purgative group are often indispensable specially at the beginning of treatment. But as most patients are unwilling to take it long, all effort should be made to educate the bowels in such a way that at the proper time an urgency for defaecation is felt. This list of purgatives is so numerous that it is not always possible to mention their actions except in groups to which the individual belongs.

Saline purgatives. As they act by withdrawal of water into the gut by osmosis and the evacuation is as a rule watery, they are indicated for the fat, plethoric subjects or for persons having hepatic and portal congestion, or in cardiac or renal disease with oedema. They are better avoided by debilitated old or nervous people. Women are also not very good subjects for treatment by saline purgatives.

Salines are usually taken well diluted just before break-fast. Sulphates, phosphates and tartrates are used for such purposes. Dose varies according to individuals. Magnesium sulphate is very active, because its both ions exert osmotic action. The stool is as a rule watery.

Anthracene Group. This includes a group of purges quite suitable for habitual constipation. They include aloes, senna, cascara, rhubarb, etc. Phenolphthalein also is included by some in this group. But their local action on the bowels is lost soon and not infrequently they need change one form the other. Idiosyncrasy and suitability play important part in these groups of purges and one which suits one person well, appears sometimes unsuitable for the other.

Cascara. Best given at night in one to two drams of liquid extract cascara sagrada with either tr. hyoscyamus or belladonna, in thirty and six minims respectively. The action is usually got the following morning. The dose should be gradually reduced as the bowels are educated to natural action.

Senna. Decoction over night of pods or leaves is useful. Specially suited for women. It is usually a non-griping purge. The leaves may be bought from the grocers' in an ordinary bazar and are sold in Bengal under the name "Sonamukhi" leaves. About one hundred clean leaves in nearly two ounces of hot water with a little sugar-candy and a few anisi seeds kept over night give a deep straw coloured fluid which will have a laxative action. It is pleasant to take in the form described.

Aloes. It forms the active constituent of many bed-pills and is a very useful laxative, but it may be somewhat slow in action.

Rhubarb. Best given as pilula rhei co., or pulv rhei co., in five grains of the former and twenty grains of the latter, to be repeated as required. This is of special use in children with excess of mucous secretion in the bowels.

In order to prevent the griping action of these drugs, either three to five drops of tincture of belladonna or fifteen to thirty drops of tincture of hyoscyamus may have to be added as correctives to the above purgatives. These vegetable aperients are as a rule not much habit forming.

The Mechanical aperients. These are said to be lubricants to the intestinal tract. Liquid paraffin in one to two ounces was a favourite once, but did not stand the test of time. There are numerous emulsions of liquid paraffin

with agar sold under various trade names such as agarol petrolagar, etc. But their action is often due to the small amount of phenolphthalein they contain. Generally suitable for children but is unsuitable for persons showing sometimes any bilious tendency, specially if the liquid paraffin is taken alone and in a large dose at a time, there is not uncommonly spoiling of the clothes by only the paraffin coming but without much effect on the constipation. In order to be effective purges should be taken in small divided doses twice or thrice a day along with milk or food materials.

There are others like normacol which increase the bulk of the intestinal contents, in this group are included "ispaghula" or plantago ovata seeds a household but very effective remedy, agar and other substances which gain in bulk in the intestines after absorbing water.

Castor Oil. It is seldom used as a regular purgative. It has its action on the small and large intestines, due to constipating after-effect it may be used with advantage in cases of food poisoning, diarrhoea etc., caused by irritants. In constipation of children and elderly people it is one of the best remedies. Mixed with glycerine the odour is covered to some extent.

Sulphur. The confection or the lozenge is easy to take. The laxative action is mild, the stool being soft, is of special use in painful conditions of the rectum and anal canal, such as haemorrhoids or fissures etc., though the stools may be rather offensive.

Isacen tablets.[1] One to two tablets of 1/13 gr. each, at bed time, are generally enough. In very obstinate cases two or more such may have to be given. Main action is on colon.

Enemata. These are generally indicated for cases where the stool is hard or in impacted faecal mass preventing the passage of a normal motion. They are also of use in constipation with debility, infection, inanition etc. For very weak states glycerine enematà consisting of ounce each of liquid paraffin and olive oil, are of use, as an enama for the removal of impacted faeces.

Water enema. McKenny[2] (1927) urged the use of a pint of cold water being used as an enema daily for a week, to be followed by douching on alternate days for the next seven days and less frequently later, to re-educate the bowels

1. Medical Annual, (1926), p. 535.
2. Jour. Amer. Med. Assoc. (1927), 89 : p. 1032.

to natural vacuating action. According to him two pints of warm water enema lull the intestines to sleep. Soap he thinks to be too irritating. When there is much congestion of the lower gut, normal saline or enema of one per cent soda solution, about a pint, for an adult, may be of use.

Levy[3] (1920) gave two teaspoonfuls of the following mixture per four ounces of water to be given as an enema with good results.

Rectified spirit of turpentine	5 c.c.
Cotton seed oil	25 c.c.
Glycerine	45 c.c.
Soft liquid soap	45 c.c.

Graham[4] (1929) recommended five grains of quinine bihydrochloride as a suppository for the evacuation of the rectum and pelvic colon. Glycerine suppositories, size, varying according to age, pushed up into the rectum by an oiled finger, relieves milder forms of constipation.

Bacillus acidophilus and acidi lactici, given in the living state, (to be had in ampoules) along with lactose, one to two ounces, every few days may correct the protein dyspepsia and also relieve constipation. These preparations used extensively for the correction of protein putrefactive indigestion are of use also to alter the bacterial flora favourably for the relief of constipation resulting from excess of protein diet.

Spastic Constipation

As most of these sufferers are neurotic persons, not uncommonly with an exhausted nervous system, which gets irritated easily, rest mental and physical are essential. In bad cases resisting average treatment the patient should preferably rest in bed with hot application on the abdomen to allay pain. In milder cases it may be sufficient to send him away for a change or re-arrange his life so that he may overcome his nervous exhaustion. Abdominal massage is contraindicated in these cases. Mild forms of physical exercise, after a period of rest, may do some good.

Diet. Roughage which is so useful in atonic, is injurious to spastic constipation. The food should not contain much of cellulose, raw fruits and undigestible materials as they irritate the intestines too much. Fruits and vege-

3. Jour. Am. Med. Assoc. (1920) 75 : p. 177.
4. Ibid. (1929) 93 : p. 1188.

tables should have no hard particles and preferably given after seiving them, better in the form of juice. White bread instead of brown is of use. If the patient can tolerate, fats should be given and that freely to persons who digest them well.

Medicinal.—Mechanical laxatives are suitable for these cases, and also are vegetable purges of the mild type from the anthracene group. Infusum senna, trifola-water, etc., are cheap but useful. Fruits like bael, papita are some times useful too. Belladonna in five to ten drops of the tincture or, ¼ to ½ gr. doses of the extract belladonna siccum, twice daily, may do good.

Bromides. Dram doses of peocock's bromides or ten to twenty gr. of potassium bromide, twice daily, after food are of use too in these nervous subjects, in whom the gastro-intestinal system probably shares a part of the systemic weakness and exhaustion.

Enemata. May be of use when the constipation is not relieved by the above methods, specially when there is spasm of the colon. Olive oil and liquid paraffin enema left overnight in the lower bowels, may be the last resort in protracted constipation with a greedy colon producing hard impacted stools.

Proctogenous constipation or dyschezia. This condition is most common in women, whose abdominal muscles became weak from repeated child birth. Such persons, in possession of greedy colons, may not visit the bath-room for days. Unless the intestinal contents are rendered fluid by strong purges they cannot evacuate the bowels. Besides educating them to form regular habits to go at regular hours daily, they should try to increase the tone of the abdominal muscles, and take plenty of water and vegetable so that the stools may be bulky and not too hard. In bad cases enemata and suppositories may be the last resort. But by far, the re-education and bringing back of the sensitiveness of the rectum is the ideal that one should strive to be achieved by his patient.

Constipation in children.

Infants. Usually two or more motions in twenty-four hours is normal in infants, but even if there is one stool a day provided it is sufficient, and the child grows properly there is no cause for worry. Simple under-feeding[5] as shown by failure to grow may result in constipation in infants, under

5. Reginald Miller, (1937), Medical Annual, p. 104.

such circumstances little increase of the food or according to suitability, a little excess of sugar or fat in diet is all required for an average case. In cases of sluggish rectum a stalk of a betel leaf properly oiled, may be introduced with success, other machanical devices have been improvised.

Simple atonic constipation., may be found in atonic rickety infants, with fat abdomen. They improve through proper care of their health, and diet. Addition of D vitamin, massage, and so on, may help. Vitamin B complex in adequacy increases tone of the intestines thus helps in removing constipation.

When the stool is white and chalk like, probably the biliary secretion is poor or there is excess of milk casein. Under such cases ¼ gr. doses of grey powder twice or thrice daily may do some good. In excess of casein, if milk is mixed with barley water, or cornflour, matters may improve.

After the age of infancy the treatment of constipation of children is almost in the same lines as that in the adult.[6]

CHAPTER LIV

DIARRHOEA

(Acute and Chronic)

Diarrhoea.

Besides others one essential of diarrhoea is the abnormally rapid passage of the food residue through the alimentary canal, hence it is a direct counterpart of the common forms of constipation in which the food takes unusually long time to pass out.

Diagnosis. One must ascertain first, if the passage of the stools is taking place with abnormal rapidity. When the stools are fluid or semiliquid many people think, erroneously, that they are suffering from diarrhoea.[1]

In all doubtful cases a few charcoal biscuits or lozenges are given with some food immediately after the bowels have moved in the morning. Each stool passed subsequently is examined and the one in which the charcoal is passed, is noted. If it is passed within *twelve hours'* true diarrhoea

6. Ibid—p. 105.
1. Jour. Amer. Med. Assoc. (1933), 101 : July 22nd. p. 273.

is present. In severe cases it may pass out in a few hours, if the time taken is less than four hours' most likely, not only the colon, but also the small intestines are involved. If no charcoal appears in forty-eight hours then constipation and not diarrhoea is to be suspected.

In very acute onset, the suggestion is that the cause is a toxic or infective agent. In toxic cases there may be purging, vomiting etc , but in infective states, there is as a rule fever of varying degree, quick-pulse, thirst, headache, malaise etc.

Whereas a gradual onset of chronic diarrhoea in a middle aged individual, with loss of flesh, specially if the patient was formerly constipated suggest neoplasm.

In all cases of bowel diseases, a careful rectal, sigmoidoscopic, cultural, microscopic examination of the stool are of use. In refractory or suspected cases a skiagram after barium meal or enema may be useful.

Differention has got to be made from cholera, dysentery, tuberculous diarrhoea, syphilis and cancer rectum, etc.

Etiologically diarrhoea may be :—

(1) Gastrogenic, (2) Pancreatic, (3) Enterogenous, (4) Due to colon involvement, (5) Nervous.

The tongue, palpatory findings of the abdomen, and general somatic feeling of the patient should form guides as to the indications and results of treatment.

CHRONIC DIARRHOEA

Chronic diarrhoea which is only a symptom may result from numerous different causes, hence treatment will depend upon the cause. Routine treatment of any and every diarrhoea by astringents is not justified. Before one can come to a diagnosis, a thorough examination of the stool, macroscopic and microscopic, exploration by skiagram, sigmoidoscope and by the fingers may be essential. Stomach contents may have to be seen after a test-meal. Reaction, colour, odour, consistency etc., of the stool are points which are of importance diagnostically. Tuberculosis, growth and other physical troubles of the intestine causing diarrhoea should always be excluded.

In Colitis. There may be only discomfort in the lower abdomen and diarrhoea, but it may result from (1) chronic catarrhal colitis (2) chronic ulcerative colitis (3) from growth in the colon.

Nervous or Lienteric diarrhoea is due as a rule to excess sive irritability of the intestinal nerves. It generally manifests itself as an urgency for evacuation of the bowels during or immediately after a meal. During emotion or fear also the bowels tend to act.

Enterogenous may be due to catarrh of the small intestines caused either by stagnation of circulation as in cirrhosis of the liver, pressure on the portal veins, ascites etc. In cases of chronic alcoholism, catarrh, irritation of undigested food causing diarrhoea, there may be infections. Chill on the abdomen may sometimes cause diarrhoea. The stool may contain some unaltered bile, specially in children, when the small intestine also is involved. Tuberculous diarrhoea is not uncommon, the doughy feel of the abdomen, may be evening rise of temperature and failure to respond to average treatment may help to come to a diagnosis.

Hepatic, pancreatic. In these cases there is white, greasy stool with undigested fat, not uncommonly very offensive. The patient is generally very emaciated, from lack of absorption mainly of fats and partly of proteins.

Gastrogenic. These cases are due to chronic gastritis, or achylia. Sometimes there is vomiting along with it.

Diarrhoea due to uraemia etc. Not uncommonly cases of uraemia may show diarrhoea. Here the tongue is usually heavily coated and the vomiting persists, though the diarrhoea stops, where as in cases of ordinary diarrhoea the vomiting stops first, then the diarrhoea. But the examination of the cardio-renal system and a careful urine analysis, and blood biochemistry may solve the mystery.

Reaction of stool. From the reaction of the stool diarrhoeas may be divided into fermentative with acid stool, as tested by litmus paper, as opposed to putrefactive with alkaline reaction.

TREATMENT OF ACUTE DIARRHOEA

In cases of fever and weakness the patient should be strictly confined to bed. In less severe cases too, rest, warmth on the abdomen, and avoidance of movement are of use in helping a quick recovery. If the patient is seen within the *first twenty-four* hours of onset, and with reason to suspect that there are still irritant materials in the intestine it is better to begin with a dose of castor oil emulsion. The tongue and the palpatory findings and the subjective feeling of the patient are guides as to any castor oil is to be

given or not. If the tongue is clean and the abdominal discomfort less, probably nature has done the job by removing the irritants automatically through diarrhoea. One is gradually coming to the conclusion that so long as there is diarrhoea, some irritation in the gut is likely, hence the advisability of beginning treatment always by a dose of castor oil which clears both the intestines. Castor oil mixture is given in something like the one prescribed for amoebiasis, one dose once or twice daily. In febrile or infective diarrhoea sulphathiazole, or diazine or guanidine may be useful.

In cases where there is only diarrhoea, but not much of the irritants left in the gut, a binding powder like the following may be of use.

Bismuth Carbonate	gr.	10
Kaolin	gr.	10
Soda Bicarb	gr.	5
Pulv creta Aromat with opium	gr.	2
Sugar of milk	upto gr.	40

one powder twice to four times a day after meals. Half to two grains of Dover's powder after each meal, till two such are given, may be of some use.

The above may be given suspended in mucilage tragacanth and pulv creta aromat cum opio, replaced by two to five drops of tincture of opium with good results. But any preparation of opium should be given cautiously to children and young people. In the majority of cases a little kaolin and bismuth are only required to stop the motions.

In *summer diarrhoea or infective diarrhoea,* after a dose of castor oil mixture one may give five to ten drops of dilute sulphuric acid with equal dose of dilute hydrochloric acid, once or twice a day and it may do much good. The non-official acid sulphuric aromaticus may be given in the above doses instead of the plain dilute sulphuric acid. Sulphaguanidine and sulphadiazine in proper doses are useful in acute diarrhoea.

In conditions of *pain in the abdomen,* hot fomentations, turpentine stupes may prove of use. A binder for the abdomen to prevent it from getting chilled is to be ordered in cases of diarrhoea specially when severe.

In bad cases of pain and callopse not only glucose saline need be given, but if the pain is very pronounced morphine is indicated. It is given generally in doses of 1/6 gr. of morphine and 1/100 gr. of atropine.

In cases of *intense dehydration* as is seen from the physical appearance of loss of fluid, dehydration and raised specific gravity of blood, transfusion of saline may be urgently indicated. (see Cholera).

In vomiting of a protracted nature the remedies suggested under this symptom of black water fever and cholera may be used. See page 96 etc. for details.

Food and Drink etc. During the acute stage, preferably plently of plain water, barley-water, green cocoanut water, fruit juice are given. The thirst may be intense and should be satisfied by free supply of liquids. Afterwards one may grant milk diluted half and half with lime-water. If there is vomiting, this non-irritating diluted milk be given in half to two ounces. Milk diluted with soda water, or barley water may be of use. Gradually one adds chicken-soup, baked custard, some cereal food like rice or potatoes and so on. Good butter milk, due to the salutary effects on the intestinal flora may do some good. When there is any suspicion of protein putrefactive diarrhoea as found out by the history, alkaline reaction and foul odour of the stool, bacillus acidophilus or lactic acid bacilli alone or in curd or 'dahi', may do some good. Hot food or drink may bring-about a relapse, hence the importance of giving food and drink just pleasantly warm or properly cooled down. But as convalescence progresses the patient is allowed ordinary soft rice, curry of live fish, or suitable vegetables such as green banana, figs etc. Bael fruit in its various stages may be taken either roasted or boiled in syrup, decoction of pulp, or ripe. It is of use in all forms of diarrhoea and dysentery.

Chronic Diarrhoea.—

Successful treatment of chronic diarrhoea, which, is secondary to organic disease of the intestines, like colitis, tuberculous lesion of the small intestine or cancer colon, depend upon respective proper measures.

In other conditions where no reasonable organic cause could be found out, the patient should be confined to bed, because a large percentage of cases improve considerably when put strictly to bed and a binder preventing local chilling is applied on the abdomen. Unless the patient is in bed and gets completely well and that for sometime, it may be likely that the condition will recur as soon as he is up and about.

The cases of *fermentative*[2] diarrhoea with sour smelling, frothy stools, frankly acid to litmus are mostly the results of excess of sugary food or carbohydrates.[3] In them all carbohydrate, cellulose, sweets, etc., should be completely excluded from the dietary.

A powder containing five to ten grains each of lacto-peptine, pancreatin, taka-diastase, calcium carbonate and sodium bicarbonate after food may do some good.

Putrefactive Diarrhoea which is mainly due to protein putrefaction, the stool is alkaline to litmus, very offensive and may be small in bulk. These patients should not get any other diet except barley water during the sub-acute stage and soft rice, glucose water etc., in the chronic stages. Butter milk, dahi, curd, lactic acid group of bacilli are of special value in protein dyspepsias.

Gastrogenous diarrhoea should be treated by dilute hydrochloric acid in twenty drops to a dram with double the amount of glycerinum pepsini taken after the principal meals twice daily.

The diet should contain small amounts of meat, and it must be carefully and fully masticated before swallowing.

Colitis. Catarrhal colitis of an acute type should be treated in the same lines as all other cases of diarrhoea in general.

Mucous or Mucomembranous colitis a thorough examination should be made to exclude any organic disease before the diagnosis of chronic colitis is made, as it is difficult to treat. There may be visceroptosis, and constipation as a rule present and subjects are more commonly women.

Treatment should begin with the patient in bed. If there is pain, fomentation should be given to the abdomen. The nervous temperament should be dealt with, by bromides in ten to twenty grains. Tincture belladonna in five to seven drops with liq. extract cascara sagrada in half to one dram doses twice daily may do some good.

Enemata of hot olive oil upto four ounces may be given with some relief.

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2. Schenfler, (1933). Arch. f. Verdauungsker 54: p. 145.
3. Amer. Year book of general Medicine, (1934) p. 765.

There are two groups of dietary advocated.

(1) A bland non-irritating one, consisting of lightly boiled eggs, pounded meat or fish, boiled and mashed potatoes, toast, boiled rice, 'khichuri', butter, cream, milk etc. No vegetables or fruits which leave an unduly big residue are allowed. This is advocated by many and is useful.

(2) Coarse diet--which consists of whole meal bread, raw or cooked vegetables, fruits etc., mainly advocated by German workers.

After a few weeks treatment in the above lines the patient may be allowed to leave her bed, but she should rest in bed for sometime after each big meal.

These persons usually women are highly neurotic and sometimes treatment by psycho-analysis may have to be done. But no pains should be spared to induce them to lead a normal life, with rest and physical exercise suitably combined together. They should be discouraged from making a scrutinising survey of their stools and asked to refrain from brooding over their physical ailment and abdominal discomfort.

Giardiasis[4] may show besides *diarrhoea, syndrome like duodenal ulcer, sprue, etc.* specially in children[5] and young people, but adults in India are not at all exempt

The examination of the stool reveals the cysts which are typical and diagnostic or the living organism, which is a flagellate.

Treatment is simple but effective and consists in oral exhibition of one tablet of mepacrine hydrochloride after some food thrice daily for five consecutive days, or interspaced by one day's rest after the third day of medication. The treatment may have to be repeated after a week or fortnight after proper examination of the stools. Children should get the doses according to body weight etc. But generally five full day's treatment appears adequate in most cases.

Though suggested to be non-pathogenic[6] by some giardia are certainly pathogenic specially in India.

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4. Dhar (1944, April) Indian Med. Record.
5. Veghelyi (1940, April) Am. Jour. Dis. childhood p. 793.
6. Blacklock and southwell (1938) Guide to human parasitology. 3rd Edition p. 71-72. H. K. Lewis publication.

CHAPTER LV

ULCERATIVE COLITIS

Diagnosis: Though various organisms have been isolated from culture of the stool of these patients of ulcerative colitis including those isolated by Bergen of Mayo Clinics, damage done by some preceding dysenteric infection amoebic or bacillary, the causative agent having died out or disappeared after having started the of ulceration of the large gut, may be the causes. These ulcers in constant contact with septic contents of the gut fail to heal. The mental depressive and introspective background of the patient may be the precipitating cause of the trouble which often brings on a relapse. According to some, the mental depression is the effect of the disease.[1] Young persons and adults of both the sexes from 20 to 40 years suffer from it showing mainly (1) Diarrhoea with blood and mucus in stools (2) Pain, discomfort griping with tenesmus due to involvement of the rectum may be present. (3) Fever of a low type is not uncommon. (4) Wasting, debility and a low grade, sometime progressive anaemia may be there, (5) opaque meal reveals (a) quick passage through the large gut, (b) lack of typical appearance of colon shadow, (c) severe cases show fine granular mottling. (6) Sigmoidoscope, is also diagnostically very helpful.

Differentiation has got to be made from dysenteries, cancer colon, pernicious anaemia and other troubles.

TREATMENT

After correct diagnosis is made, the patient should be made to realise the chronic nature of the disease requiring a very prolonged often tedious treatment for which his patient co-operation is essential. The principles involved in treatment are[2] (1) general. (2) Dietetic. (3) local irrigation. wash etc. (4) Drugs (5) symptomatic (6) Progress and Surgery (7) Complication (8) Prognosis.

1. *General* This aims at healing of ulcers and increase of resistance. He should be in bed keeping his abdomen

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1. McNee and Smith (1940) Text book of Medical Treatment p. 587 (Livingstone Publication, Edinburgh).
2. Napier (1943), Principles & Practice of Tropical Medicine, p. 456 (Thacker Spink, Calcutta).

warm, covered by a binder and should avoid chilling of the body. Bed rest is essential so long he is either febrile or passing blood and mucus in stool. This bed rest and warmth hastens recovery. The *nervous depression or introspection* should be corrected by an adequacy of vitamin B complex, glycero phosphates, bromides, etc., according to suitability. In cases of anaemia iron, digestives, hydrochloric acid may have to be tried.

2. *Dietetics*—is of importance. During the initial acute stage, or at the beginning of treatment of bed rest he should preferably be on liquids. Milk and its preparation butter milk (ghole or lassi), milk diluted, peptonised, citrated and and fruit juice should be the main diet, with the return of appetite and power of assimilation, as judged by stool examination, also solids should be added cautiously. In short (1) all hot spiced food, strong tea, alcohol, too pungent or too hot or too cold food should be avoided. (2) all food should be taken leisurely without any hurry and they should be masticated very well. (3) The routine is something like the following—

Early morning:—one cup of milk and barley or gruel, Bengers food or Horlicks malted milk for those who can afford. *Break fast* one poached egg or soft boiled, toast one piece, to make upto 2–3 pieces later on if one is assimilated, butter in small quantities to increase gradually, milk and barley or corn flower or rice powder boiled with milk, as pure milk may not be digested and absorbed properly. Tea or coffee between these and lunch; some fruit juice say half a cup of orange juice or ¼ cup tomato juice; where these are not available juice of fruits of the season like mangoes, shaddock or other suitable fruit are essential specially because of its C vitamin content necessary for healing of all ulcers and wounds. *Lunch and dinner*, should be light with some soft boiled hot rice with butter, lean fish soup, chicken where possible. Dal and vegetables should leave no residue and may have to be seived through; mutton or goat flesh should be minced and chewed well and properly. Milk and rice boiled, pudding like baked custard, jellies, seived fruits or fruit juice may be allowed. Toast with butter, biscuits and other light diet is allowable. Milk plenty, weak tea, marmite soup, may be given.

Vitamin—Concentrates like compressed yeast tablets, marmite for B content, fruit juice for C, adexolin, or navitol or haliverol for A and D vitamins should be supplied liberally because under diseased conditions the vitamin need increases.

3. *Treatment of ulcer*—During the first few days sodium sulphate two dram doses 4 to 6 hourly will not only cleanse the bowels but by regular evacuation may help in the healing up of the ulcers and also the fever may come down. Half a dram of tinct of Hyoscyamus and few grains of Pot Bromide may be added to this mixture.

Irrigation—When the ulcers are chronic and refractory, irrigation of the large bowel is the best treatment. Numerous solutions are in use but in every case the bowels should be washed out first by a pint of warm two percent sodabicarbonate solution. The patient being asked to retain the enema which should be allowed to run in very slowly and gradually. After being retained for some time say 10 minutes or there about he is encouraged to evacuate it completely. Then is given the medicated enema in gradually increasing amount, beginning usually from four to six ounces of lower strength to be increased gradully to half a pint of higher strength if only the lower bowel and the rectum is affected. In case of ulcer of the proximal part of the large bowel a pint or a pint and a half may be required to be given very slowly and the patient encouraged to assume a knee-elbow position. He should be asked to change his posture in bed and a pillow or cushion put under his sacrum to allow the fluid to flow up towards the proximal colon. This is best done through a stout rubber catheter with pressure of about 2 feet height. He should be encouraged to retain the fluid as long as he can even up to five hours. These are generally given daily but if it exhausts the patient or if he is already weak and debilitated it is better to irrigate on alternate days—initially, to be made daily later on. *Strength of the silver nitrate solution* if used should be one in thousand of aqua distill intially to be increased in 2/3 days to 1 in 750, to 500 to 400, to 300, to 250. The greater strengths may have to be changed once a week or so. If these cause pain a lower strength or even washing with normal saline may be required to fix up the silver nitrate until the symptoms have subsided in a several weeks time.

Some prefer tannic acid solution gr. ½ to 2 per ounce and is also used. Argyrol ½ to 1 per cent, solution, acriflavine 1 in 20,000 are advocated.

4. *Drugs and sulphanilamide*—Though the amoebae may not be found, in some cases specially with the history of previous amoebiasis.

Amoebarson or Carbarsone, or Enterovio-form or Chiniofon in suitable doses may do good and should be given a trial. In cases of amoebic history chiniofon irrigation half to 1 per cent may be tried also.

Sulfathalidine in ulcerative colitis etc.

Recently[3] phthalylsulfathiazole or Sulfathalidine (Sharp and Dohme) is used in daily doses of total three g divided into one tablet or 0.5 g. every four hourly with an initial dose of one to two grams. Ross and Poth[4] have reported that phthalylsulfathiazole is absorbed sparingly from the gastro-intestinal tract, it maintains low concentrations in the blood (0.1 mg to 1.5mg) and that it is rapidly excreted in the urine; they claim that the new drug has two to four times the bacteriostatic activity of sccinyl sulphathiazole[5] and that causes no toxic symptoms in man[6]; out of the hundred patients treated 72 were female and 28 male; of these 80 had chronic ulcerative colitis, 6 amoebic dysentery, 2 bacillary dysentery 8 giardia lamblia, 2 paratyphoid, dientamoeba infection. In ulcerrative colitis both the acute and the chronic cases improve equally effectively. The results in Giardia lamblia and in dientamoeba while favourable a larger number of patients have to be tried upon before a definite result could be shown.

Clinically out of 100 patients 84 demonstrated good and 6 fair result and 10 poor result to treatment. "In chronic ulcerative colitis cramping in the abdomen subsides within seventy two hours, the evacuations are reduced in number the stools show a tendency to become formed and odorless and the blood in the stool disappears in a few days after intake of the new drug. The patient feels better, eats better gains weight. The acute fulminating types respond well in that the temperature is reduced considerably in seventy two hours, the evacuations become less frequent and the tenesmus subsides." Some patients took it for weeks others were on the drug on a specific dosage for six to nine months without interuption to prove non toxicity.

As regards dosage three gram daily appears as effective as larger doses, the smaller dose has the advantage of causing neither crampy feel of the abdomen nor diarrhoea evoked by larger dosage.

3. Streicher (1945 Dec. 15) Jour. Amer. Med. Assoc. p. 1080.
4. Poth and Ross (1943) Federation Proc. 2 p. 89.
5. Streicher (1943) M. clin. North America 27. 2, 189.

The three gram dosage has got to be taken for a few more days than the larger dosage, and can be continued for months if desired.

This new remedy reduce the number and character of the intestinal bacterial flora most effectively and often remarkably specially of colon, e.g. coli, strepto and staphylococi.

5. *Symptomatic Treatment.*—Except during the first few days when Sodium Sulphate has been advocated already, no strong purgatives should be exhibited. Ispaghula, (Plantago ovata) with sugarcandy water or by itself in one to 4 teaspoonful doses once or twice daily as required, or "Trifola" water or decoction of three dried fruits early in the morning are useful by keeping the bowels open and are non-irritant laxatives. Purges which cause intestinal irritation and strong are unsuitable for these patients.

Anaemia :—This requires careful treatment by either 2 to 3 grs. of *ferrous sulphate* or ferric chloride twice daily after food with 4 to 6 drops of liquor arsenic hydrochlor. *Liver* extract may have to be injected simultaneously along with oral iron, arsenic and nuxvomica. In advanced cases the treatment may have to be started by a transfusion of compatible whole blood. This often hastens the recovery materially. Adequate B vitamin complex in the from of eggs, compressed yeast tablets, marmite, are useful. When the tongue is raw and mouth sore B complex with additional nicotinic acid tablets or injections help much.

Griping, Discomfort—of the gut or diarrhaea may require antispasmodics like tincture belladonna or hyoscyamus, with bromides and even with tincture opium in 1 to 3 drop doses, or tincture opii camphorata in 10 to 20 drop doses along with the mixture. These opium preparations are some times very useful sedatives of the irritated gut, but they should gradually be reduced in dose and strength to eliminate from the prescription finally.

For *diarrhoea* or *dysentery* besides regular evacuation of the irritant material, intestinal binders like bismuth salicylate 10 to 30 grs. with or without 2-5 grs. of Dovers powder may have to be used. Tenesmus, requires, when severe, starch opium enema of starch ounce one, tr-opii m 10 to 20, aqua two ounces.

Nervous System as already suggested should receive careful consideration. Not uncommonly shock, fright,

worry, anxiety may bring about a relapse. Bromides, glycerophosphates, vitamin B complex are useful for these purposes.

6. *Progress and Surgery* :—Except in very serious advanced cases, the above lines will not only remove symptoms but also his appearance will improve with a gain in weight.

Unless the dieto—hygienic regime is followed persistently for months and even years, though he is thought to be cured and is up and about, there is a *chance of a sudden relapse*. This should not be lost sight of and one has to regret the loss of so much pains and troubles to his own self as well as to his patient. When the ulcers are low, sigmoidoscope gives an idea as to the stage of recovery and progress of the case, other means are by microscopic examination of the stool etc.

Surgery.[6] If the patient fails to improve in three to four months medical treatment, and after several changes of medicine for bowel wash, the question of surgical aid should be seriously considered. Two operations *appendicostomy* to facilitate efficient bowel wash *ileostomy* by this the faecal matter from the upper bowel is side-tracked also. The former is easy to perform the later may be more useful. Surgery may prove failure when the patient is submitted to the knife too late, specially it need be done before any fibrosis of the gut has occured.

7. Comlications—like haemorrhage, perirectal abscess, stricture, arthritis, polyposis of the gut requires mainly surgical or suitable aid.

8. *Prognosis* :—Depends on early diagnosis; suitable and proper treatment instituted early and carried out vigorously from the beginning with willing patience and co-operation of the patient.

Except those who are far advanced having their tissue resistance exhausted out will improve under proper careful treatment suitable to the individual case.

CHAPTER LVI

HAEMATEMESIS AND MELAENA

There may be numerous underlying causes for these symptoms, the commonest of them being, gastro duodenal

6. Jones (1938) Jour. Am. Med. Assoc. III p. 2076.

ulcers, though haematemesis is more common in gastric and melaena more frequent in duodenal ulcers, due to their anatomical position. They are common in cirrhosis of liver, carcinoma of the stomach, rarely in cardiac decompensation and others. Blood from nasopharynx, mouth, oesophagus may pass into the stomach and give the impression of haematemesis. Blood diseases and anaemias, may also give rise to bleeding into the stomach. Certain obscure states of congestion and inflammation of the stomach may produce blood vomits. Blood from stomach if passes to the intestines, black or tarry stools may result. In cirrhosis of liver, haematemesis may take place before collateral circulation is established.

TREATMENT

If there is too much loss of blood the extremeties may have to be bandaged and the foot end of the bed raised. To combat shock except in cases of cirrhosis of liver morphine in 1/6 to 1/3 gr. with atropine in 1/200 to 1/100 of a grain may have to be given subcutaneously. Willcox[1] (1924) warns against indiscriminate use of morphine. In cirrhosis the detoxicating power of liver having been lost, 1/4 gr. of morphine may be sufficient to cause death. Morphine, atropine helps to control the haemorrhage by diminishing the peristalsis and lessening the tone. An ice-cap hung from a suitable support, just touching over a lint that part of the abdomen whence the bleeding is probable, may be of some use. This is given for three hours consecutively with an hour's rest.

Diet etc. Conservative treatment prompts that no food is to be allowed for one to two days, except pieces of ice to suck. According to this view the bowels should be washed by an enema after some time, say eighteen to twenty four hours, and six to eight ounces of five percent glucose in normal saline given rectally every four hours or so or continuously.

But Meulengracht[2] (1933) has for several years treated haematemesis and melaena, by a liberal diet from the beginning. According to him, the conservative regime of starvation and cautious feeding, causes unnecessary exhuastion, and often the bleeding stops when a liberal but cautiously chosen diet is given. To starve unnecessarily a patient

1. Lancet, (1924), i, p. 544.
2. Lancet, (1933), ii, p. 1220.

when he is in the greatest need of supportive diet, is according to him, not only unscientific but also against reason. It is also problematic, if to allow the stomach to remain empty with the acid secretion for a long time, tending to keep an ulcer active, is a sound rule. He gives puree diet which includes—at six A.M. tea with white bread and butter; nine A.M. oatmeal with milk, white bread and butter; one P.M. dinner; three P.M. cocoa; six P.M. white bread and butter meat dishes, cheese and tea; variety is given by meat balls, poached eggs, fish balls, rice, tapioca, puddings, soups etc.

Fluids. Small sips of fluid may be allowed even under the conservative regime after the first twelve to twenty-four hours. In cases of big haemorrhage subcutaneous saline injection in one to two pints with ten to twelve point five percent glucose may be useful. But the blood volume should be made to increase with caution as it is by the loss and consequent lowered blood pressure that the coagulation starts, and to disturb it by increase of the volume of blood may not be very safe, unless done cautiously and gradually.

All haemostatics are more or less of doubtful value, but they need be tried, specially to do something for the patient.

Haemostatics. Some believe in giving two c.cm. of adrenalin chloride solution (1 :1000) in a few ounces of water to be taken in sips with the idea that it will act as a local haemostatic and may be worth trying in all intractable cases of gastroduodenal origin.

Coagulants such as *whole human blood* ten to twenty c.cm. intramuscularly into the buttocks, every eight to twelve hours is worth a trial, but the donor should reasonably be free from syphilis, malaria and such other communicable disease. *Sodium citrate* solution five to ten per-cent five to ten c.cm. intramuscularly or intravenously may act as a good coagulant by breaking down the platelets. *Haemoplastic* substances like *coagulen (ciba) haemoplastin or neohaemoplastin* in two to ten c.cm. may have to be given with good result. One per cent solution of *Congo red* upto ten c.cm. intravenously may be used with advantage. All these remedies may have to be repated every four to eight hourly. Moldman (1937) has treated twenty-one cases of severe gastro-duodenal haemorrhage by the continuous oral administration of *colloidal aluminum hydroxide* by means of a special drip apparatus with success.

Transfusion of complatible blood even upto five hundred c.cm. may tide the exsanguined patient over and help to combat the original disease.

Diet. Vitamins specially A, B, C, and K are of use. Fruit juice, eggs, butter supply them all to some extent. According to the conservative methods, soft boiled eggs, milk and porridge etc., may be allowed after twenty-four to forty eight hours according to the severity of the case. But here too Anderson[3] basing on the work of Carlson (1924) argues that empty stomach is never at rest, hence he allows the following diet which readily neutralises the juice of gastro-duodenal ulcers.

His formula is :—

Gelatin	gr. 15
Lactose	gr. 40
Water	upto fl. oz. one

To each feed of four to six ounces of the above mixture, juice of an orange is added and given every one half to two hourly for two to three days. Then the above is alternated with a mixture containing sixteen parts of soft gruel of some cereal, like oatmeal, or rice and milk fourteen parts, cream four parts, lactose, three parts. These two are alternated for the first two to four days, then custard, eggs, are added. Gradually when the risks of haemorrhage are over the patient is put on an ulcer dietary. This method of treatment of haematemesis is said to have been tried with success in the Long Island College Hospitals.

In cases of Shock etc. Intravenous injection of twenty-five to fifty per cent glucose in twenty-five to hundred c.cm. given very slowly may help also, besides combating shock, by promoting coagulation. This may be repeated every six to twelve hours as indicated.

Drugs. Later on, the treatment of the ulcers by some suitable method is indicated. Belladonna, bromides, antacid powders, oils and fats etc., may be of value, (for details the chapter on gastro-duodenal ulcers may be consulted).

Surgery. The immediate treatment is always medical. *Patterson*[4] (1924) at a discussion of the Royal Society of Medicine pointed out that one in nine cases dies under medical care, and one in three will die under immediate surgical intervention. Bennett (1934)[5] at a discussion of

3. Amer. Jour. Med. Sci. (1937), 194 : p. 333.
4. Lancet. (1924), i, p. 543.
5. Proc. Roy. Soc. Med. (1934), 27 : p. 1530.

the above learned society also came to the conclusion that indications for surgery are extremely rare. The indications for surgery are already given in the chapter on gastroduodenal ulcer.[6]

The haematemesis of *cirrhosis of liver* is not uncommonly salutary, and may act as a safety valve. The treatment is more or less in the above lines, though without much treatment, once the venous pressure is relieved by bleeding, spontaneous cessation is likely.

Melaena. For the details of treatment of this condition haemorrhage in typhoid fever may be consulted on page 128 etc.

CHAPTER LVII

COMMONER DISEASES OF LIVER AND GALL-BLADDER

JAUNDICE

Diagnosis etc.

Jaundice or icterus is a symptom characterised by the presence of bile pigment in blood, manifested by yellow colouration of the skin, mucous surfaces, pruritus, slow pulse, nausea or vomiting, delayed coagulation of blood and others. Hypoprothrombinaemia is common too.

As the treatment, to be scientific, should be according to the cause, it is imperative that a proper diagnosis as to the pathogenesis of a particular case of jaundice is first made out, before treatment is undertaken.

The diagnosis may be facilitated by the history, age, sex of the patient. Presence or not of fever, toxaemia, pain, etc. may be useful. The duration, degree of jaundice, condition of gall-bladder, liver and spleen, nutritional state of the individual may afford important aids in diagnosis.

The character of the duodenal contents, van den Bergh's test[1], fragility of the red blood corpuscles and others also may afford some clue as to the underlying cause of jaundice. The solong known catarrhal jaundice appears to be an infective virus jaundice in the light of modern work. The literature are voluminous on infective hepatitis.

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6. Hurst, (1936), Guy's Hosp, Rep. 86: Jan-April, p. 135.
1. Mc. Nee, (1923), Quart. Jour. Med. 16: p. 390.

TREATMENT

This should be done according to the corresponding pathogenesis. Rest in bed, warmth and poultices or cataplasma kaolini etc., over the liver and gall-bladder region may be of relief. No fats and very little of protein except milk casein, which is a protector of liver, milk preparation and carbohydrates and sugar should be allowed in the diet, specially during the acuter stages. For the constipation which may be associated with lack of bile should be combated by saline purges or by purgatives of the anthracene group. Divided doses of hydrarg subchloride, in a prescription like the following may be of use.

Hydrarg Subchloride	gr. 1/2
Soda Bicarbonate	upto gr. 2

one every half an hour at bed time till four are taken, followed in the morning by saturated solution of magnesium sulphate half to one ounce. Frequent uses of saline purgatives and alkalies are beneficial.

Vomits etc. These should be treated in their usual lines according to the cause, or as in blackwater fever, for details see page 95 etc.

Non surgical drainage.[2] Introduction of a solution of magnesium sulphate through a duodenal tube into the duodenum causes a great flow of bile. This measure has been utilised for the purpose of draining the gall bladder in cases where there are indications.

Meltzer[3] (1917) was one of the first to describe it. Generally seventy-five c.cm. of a thirty three per cent solution of magnesium sulphate are introduced by a duodenal tube[4] (Ryle's modification of Einhorn's tube). The action is described. "It may relax the sphincter of the common bile duct and permit the ejection of bile and permit even the removal of a calculus of moderate size etc." Different types of bile appear, first from the common bile duct, then from the gall-bladder and so on. Lastly comes bile from the liver.

This drainage may be continuous or intermittent. It is useful in the treatment of most of the following conditions. (1) Relapsing cholangitis. (2) Obstructive jaundice. (3) Quiescent cholelithiasis. (4) In other bile tract disease where sur-

2. Twiss, (1933), Jour. Amer. Med. Assoc. March 18: p. 792.
3. Jour. Amer. Med. Sci. (1917), April, 53: p. 469.
4. Einhorn, (1920), duodenal tube and its possibilities, Saunders, Phila.

gery is contra-indicated. (5) For closure of billiary fistuala. (6) Catarrhal jaundice clears up usually from two to seven days. (7) Early gall-bladder and bile duct inflammation. (8) Continuous drainage is good for gall-tract disease with duodenitis or average case of duodenal ulcer. (9) In hepatic and intestinal toxaemia. (10) Sick headache. (11) Some forms of neuritis, arthritis etc. suspected to be due to sepsis of the gall-bladder. (12) Useful for carriers of Eberthella typhi group of organisms and giardia intestinalis. (13) Other conditions which improve are chronic pancreatitis, intestinal and billiary stasis, haemolytic jaundice etc.

Damage of the liver. All cases of jaundice cause some degree of damage to the liver cells, but this is pronounced in toxaemic jaundice and acute yellow atrophy liver. In all cases where any injury to the liver is suspected five remedies are of use; they are milk casein and its amino acids and vitamin B complex, glucose, alkalies and calcium.

According to Allhausen[5] (1933) glucose is protective to the liver, (1) by its assistance to oxidize toxic compounds, (2) functional deficiency repaired; (4) increasing the coagulability of blood, which is lessened in all forms of jaundice. Insulin[6] injections with glucose may be of use.

Urotropine, solution (forty per cent) five to ten c.cm. intravenously with or without glucose, along with oral administration of alkalies may be of definite service. This should be given daily or every twelve hours till six to twelve such are injected. Useful in infective hapatitis and simple forms of jaundice and biliary cirrhosis, and in infection of the gall-bladder.

Cylotropin, a combination of Urotropine and caffeine has been extolled by some. One ampoule given by intravenous injection daily or on alternate days may suffice, but appears to have some advantageous effect over urotropine, *specially in infections* of the gall-bladder.

Alkalies, milk casein, vitamin B complex with plenty of C vitamin, calcium etc. per mouth, should be given. Sodium salicylate appears also effective in some of these cases. Orally one may give a prescription like the following.

5. Jour. Amer. Med. Assoc. (1933), 15th April, p. 1163.
6. Barker, (1934). Treatment of commoner diseases. p. 162 Lippincot.

Soda Salicylate	gr 5
Soda Bicarbonate	gr. 30
Soda Phosphate	gr. 60
Ammonium Chloride	gr. 8
Soda Glycocholate	gr 5
Glucose powder	gr. 60
Chloroform water	upto fl. oz one

one dose thrice daily.

Saline purgatives should be given freely. *Bowel* washes given daily may be of use specially when the intestinal flora of bacteria are likely to be a probable cause. Calcium gluconate with parathyroid and vitamin D may be advantageously given orally. Ostocalcium tablets, and K vitamin, calciferol may be of use. If intestinal coli infection is suspected, sulphasuxidine with sulphathalidine in proper doses may be tried with caution.

There are doctors who advocate with some reason too, the administration of *dilute hydrochloric acid in small* doses in sips with water twice a day before or after meals due to achlorhydria or hypochlorhydria common in jaundice.

Itching. Divided doses of hydrarg subchloride in a prescription like the following may do good.

Hydrarg Subchloride	gr. 1/2
Sodii Bicarbonatis	ad. gr. 2

one powder three or four times a day at half hourly interval after last meal at night.

Carbolic acid solution one in hundred in distilled water may be used to wipe the areas where it is itching. One to two per cent. solution of sodium bicarbonate in distilled water may be used to wash the itchy parts. A hot bath in alkaline water followed by rub of rectified or methylated spirit and proper dusting with powder may cause some relief.

Recently histamine is being used with advantage for pruritus. It is given by subcutaneous injection in very minute doses.

Pilocarpine in 1/4 to 1/8th grain, orally may relieve this troublesome itching. Some suggest 1/4 to 1/2 gr. of extract thyroid siccum three times a day for the pruritus.

For haematemesis and melaena the corresponding chapter should be consulted.

Haemorrhage. For the haemorrhagic tendency calcium in the form of gluconate and levulinate, five to ten percent solution in five to ten c.cm. may be injected with

good results. It may be repeated every eight to twelve hours according to requirement. Liver extract may do some doubtful good. But as jaundice impairs the absorption of fat, hence all the fat soluble vitamins like A, D, E, and K are deficient in blood. Specially the lack of K vitamin causes hypoprothrombinaemia, hence easy bleeding and diminished coagulability of blood, so synkavit or K vitamins should be given liberally to the jaundiced patients.

Fruits etc. Butter-milk, milk-casein, sondesh, rosogolla, channa sugared etc. fruit juice, sugar or sugar candy water with lemon juice, dab-water, sugar cane juice, barley water, soda water, etc. are helpful by promoting diuresis and protect the liver from damage. Milk casein and vitamin B complex are liver protectors.

Cholaemia. Not uncommonly in bad cases the patient may show cerebral symptoms due to cholaemia which may manifest in undue sleepiness or excitement. It is rather a serious condition and may terminate the scene in cases of toxaemic jaundice, cirrhosis of the liver and so on.

Treatment consists in giving injections of ten to twenty units of insulin every eight to twelve hours, with double the amount of glucose in grams as the units of insulin. Transfusion of normal saline with glucose may also be useful. Bromides are best for quietening the patient. Preparations of opium may prove dangerous due to the loss of the detoxicating power of liver. But recently one is learning that plenty of methionine, choline, cystine with plenty of B complex can save the liver from damage which would otherwise destroy the organ before therapy was known.

CHAPTER LVIII

CIRRHOSIS OF LIVER

Pathogenesis—"There is a close analogy between cirrhosis of the liver and certain vitamin deficiency diseases in which diet alone may correct the condition when it can provide a sufficient amount of deficient factors."[1] Alcohol appears to cause intestinal catarrh where low intake of protein combined with insufficient B complex[2] and consequent

1. Beams (1946, Jan. 26), Jour. Am. Med. Assoc., 130: P. 192.
2. Rimmerman, Schwartz et al (1944 Dec.) Am. Jour. Digest Diseases II, p. 401.

anorexia form a vicious circle, which are contributory factors to the production of cirrhosis of the liver. Experiments on animals have shown conclusively that lack of certain amino-acids like methionine, cystine and choline, which are present in milk casein[3] and B complex causes first fatty changes in the liver, continued lack of those food factors conduces to replacement fibrosis. But when during this precirrhotic fatty stage, with an enlarged liver the lipotropic amino-acids, already mentioned are supplied for a prolonged period the patient though might have had ascites yet improves, and finally gets allright. But cases of ascites with impalpably shrunken liver are not improved under the above dietary regime because there has been irrecoverable fibrosis already in the liver due to prolonged lack of these dietary, factors.[4] So the recent treatment consists in supply of these deficiencies in the form of aminoacids where available or in their absence milk casein hydrolysates and other proteins and B complex in the form of yeast, mar-mite in adequate amounts and that for prolonged periods. So long known to be an incurable condition it now appears curable when treated early. About 10 to 15 grains of choline chloride before meals is of special use in hepatic[4] damage due to insufficient protein intake.[5]

Diagnosis etc.

Though there are several forms of cirrhosis of the liver, the commonest is the portal or multilobular cirrhosis in which the liver surface is irregularly nodular, hence called hob-nail liver, the organ being impalpably shrunken.

Generally the patient is above the age of thirty years, though an infantile form is also known, shows enlarged spleen, prominent veins on the abdomen; haemorrhoids, haematemesis or melaena are not infrequent. Ascites, poor nutrition, the typical hepatic facies etc. make the clinical picture highly suggestive. In the early pre-cirrhotic stage there are symptoms of gastric catarrh and those of congestion of the liver, the edge of the organ is sharp and hard like the edge of knife. Waterbrash, indigestion, loss of ap-

3. Daft, Sebrell, Lillie (1941 Oct..) Pro. Soc. Exper. Biol and Med. 48 : p. 228.
4. Blumbery, McCollum (1941, June 20) Science 93 : p. 589.
5. Mateer et al (1947 March 29) Jour. Am. Med. Ass. 133 : p. 909.

petite, constipation may dominate the scene. Later on comes the typical cirrhotic stage with most of the symptoms and signs mentioned above.

HYPERTROPIC BILIARY CIRRHOSIS

The condition is generally seen in young persons between 10 to 30 years. There is palpable enlargement of the liver which is as a rule smooth. The spleen is also enlarged. Jaundice is generally pronounced. Fever may be present and other young members of the family may be affected too. The disease appears to be infective in origin. Absence of parasites in the blood and other cogent findings distinguish it from similar morbid states in which jaundice is associated with enlargement of both liver and spleen. Some workers think it to be an infection and not cirrhosis of liver.

TREATMENT

In the early stages.

Removal of the probable causes is the most improtant treatment.

The patients should have as much of rest in bed as possible, three to six weeks or longer are preferable. He may sit up for a few hours if he likes. Alcohol, hot spices, mustard, pepper, curries etc., should be avoided altogether. He should live mainly on milk, three to four pints and B complex with fruit juice and glucose drink in between. Plenty of alkaline or plain water is good for him.

Diet suggested is for therapeutic and preventive purposes (1) *Methionine* in 2 to 4 g daily, cystine and choline 2 to 4 g daily, (2) *a protein rich diet*, the proteins derived mostly from milk and its products, about 2-3 pints of milk and eggs are good sources of protein, (3) *limited intake of* fat better is fresh butter about 10 g and cream from milk one ounce. (4) *yeast or marmite* 20 *to* 40 *g daily or suitable combination of B complex in adequate amounts. Diatene* a milk product has been found useful, *choline* appears to prevent fibrosis of the liver and *acts better in combination with cystine.*

For an average Indian a diet like the following may be useful for these cases :—

1. *Breakfast*—milk one glass boiled with or without powdered barley or rice to help digestion, bread, (channa)—milk casein sweetened, or where available *sandesh, roso-*

golla all products of milk casein. Small portion of butter or cream, fruits, and one egg, 2-4 *grams of yeast or marmite,* cheese in small amounts.

2. *Lunch or noon meal* Fish, cheese small portion, bread, small helping of meat, boiled or stewed, milk products, dahi or sour milk without much fat, yeast extract, diatene a milk product, some form of protein hydrolysate like pro-nutrin etc. with soup or milk flavoured. Liver and its preparations in small amounts may be useful.

3. *Afternoon,* something like breafast with some fruits, and sweets made out of milk casein.

4. *Dinner* --like lunch.

N.B. As milk and milk casein and its products with adequacy of B complex are the dietary of choice for prevention and cure of cirrhosis of liver these should constitute the main items in the patient's dietary. Our old idea of withholding of proteins in diseases of liver, specially in cirrhosis is no longer tenable, on the contrary, lack of protein specially of milk casein type and B complex lead to cirrhosis, a radical change in our old idea of this disease, when proteins were contraindicated. Daily diet should aim at 110 g of protein mostly derived from dairy products, meat, vegetables and about 50 g of fat and 150 g of carbohydrates, 30 to 45 g of yeast, daily. *But along with it methionine, choline and cystine should be added in doses given already.* A concentrate of A vitamin appears of special use, due specially to liver damage.[6] C vitamin is a protector of liver from toxicity.

Purgative. Salines are useful and may be given daily or on alternate days and may be preceded by divided doses of hydrarg subchloride where indicated.

One of the best intestinal antiseptics is dilute hydrochloric acid in half to one dram doses after the main meals twice or thrice a day. As there is gastritis and achlorhydria in many cases, so it is useful. Gradually a lactovegetarian diet should be added. Butter-milk, lactic acid bacilli, bacillus acidophilus, milk curdled by the above organisms may be of use, by rendering the intestinal toxaemia lesser, because these lactic acid group of bacilli tend to alter the bacterial flora of the intestines to the advantage of patient Fish may be granted in small portions, once a day after the acute symptoms are over and that also according to the

6. Ruffin and Wise (1945, June.) Gastro-enterology 4: p. 466-472.

liking, previous habit, digestive power etc. of the patient. Meat in small portions is given when, such addition is reasonably safe and does not entail any difficulty. When digestion improves and fat is properly assimilated small portions of fresh butter, cream etc. may be added to the dietary. Egg, butter-milk, Indian sweets like sandesh or rosogolla, milk casein should be given in adequate portions, Carbohydrates, fruits, sweetmeats unless fried and thus made undigestible, may be allowed. B complex like yeast, marmite, should be given in some form three to four times a day.

Physical Exercise. Beginning from mild forms one goes on gradually to more vigorous physical exercise. At the beginning massage, deep breathings, tepid bath and massage etc., are suitable later on as strength permits, one may take gradually increasing distances of walk, and if this is well tolerated, rowing, golfing etc. are to be allowed. Some form of reasonable physical exercise is good for these persons.

In syphilitic cases potassium iodide and other antisyphilitic remedies are of service and should be given according to indication.

ASCITES

As ascites in cirrhosis of liver is also due to hypoproteinaemia and colloidal imbalance, a protein rich diet as indicated already consisting mainly of milk and milk-casein and B complex should always be supplied for the possible favourable change in the organ. If the liver is of fatty infiltration with early collection of fluid, that case is likely to get allright.

Beams[1] treated twenty patients of cirrhosis of the liver with ascites by a high protein, low fat diet supplemented by yeast and a combination of choline and cystine. Twelve out of these twenty showing no enlargement of the liver (thus irrecoverably fibrosed and impalpably shrunken) showed no response to this management, whereas, seven out of the eight patients with large liver (only probably with fatty infiltration) made a recovery from decompensation of the organ.

By comparison with a series treated in the above lines without cystine and choline showed that these had a favourable influence in the treatment of cirrhosis of the liver. The treatment appears satisfactory only where fatty changes are present in the liver. Methionine also had a satisfactory effect. Cystine and choline were given in 2 g or half a dram

doses three times a day. Methionine also should be given in above dosage daily.

When a careful and prolonged trial on the above dietary regime fails to cure the patient he may be treated symptomatically in the lines given below. But the dietetic regime the sheet anchor of therapy in this disease, should never be neglected.

As soon as fluid tends to collect in the abdomen, besides trying to rectify further damage to the liver, as indicated above by diet etc. one should give saline purgatives and diuretics freely, provided the kidneys are not damaged, as found out by repeated examination of the urine, and by the findings in the biochemistry of blood.

Diuretin, in four to six grains thrice daily with caffeine, sodium benzoite in similar or smaller doses, may be tried, first along with simultaneous use of saline purges, the latter also helping elimination of water. If this does not afford the desired result, one should give ammonium chloride in twenty to thirty grains thrice or four times a day and when the urine is highly acid, as tested by blue litmus paper give salyrgan.

Salyrgan group of diuretics like *neptal, esidrone* etc. are injected intramuscularly in 1/3 to 1/2 c.cm. test doses, if a good diuresis follows[7] one may stop the injection altogether. The effect of the test dose passes off in one to two days time. Again one c.cm. may be injected, keeping the urine acid all the while, in 3 to 4 days' time as the effect of the second injection passes off, another one c.cm. may be given, then again another one c.cm. and so on. Neptal group is a very bad irritant and the intramuscular injections may be extremely painful specially when even half a drop leaks into the subcutaneous tissues. The pain may be reduced in intramuscular injection by drawing a few c.cm. of novocain along with it, and also care should be taken to force the contents only after the needle is well into the muscles. In intravenous injection too, very particular care should be taken to avoid infiltration of even fraction of a drop into the subcutaneous tissues, which means terrible pain etc. Not more than 2 c.cm. should ever be given at a time, one c.cm. is better and safer and is the usual effective dose. As salyrgan is a preparation of mercury, while the patient is under treatment and after, his teeth should be carefully looked after and potassium chlorate and alum gargles given regularly at frequent intervals several times a day. Stomatitis,

7. Brunn, (1921), Munch. Wochnschor, 2: p. 1554.

salivation, ropy saliva, painful and spongy gums, swelling of the sublingual and submaxillary glands are symptoms, taken singly or collectively, mean mercurialism. The required treatment of poisoning by mercurials as indicated in the chapter on mercury treatment of syphilis should be promptly instituted. Under no circumstances this powerful mercurial diuretic should be given to persons having arteriosclerotic or incompetent kidneys. In cirrhosis of the the liver the natural detoxicating power of liver being considerably reduced these mercurials should always be given cautiously, a watch being kept over early poisoning symptoms. Needless to say that further injections should be dis continued at the first appearance of any of the above signs or symptoms of poisoning. The whole course is generally in six to twelve injections at suitable intervals as indicated above. Neptal and esidrone are other similar preparations.

Novurit. Recently there is a preparation like salyrgan, which is called novurit; it can be introduced as a suppository with good diuretic effect, besides by injection.

Guy's Pill, which consists of one grain each of pilula hydrarg, pulv digitalis, and scilla, is a good diuretic and may be given twice or thrice a day. But here too due to its mercury content good care should be taken of the teeth of the patient.

Paracentesis Abdominis. In cirrhosis of the liver and nephritis and as a matter of fact in all conditions of collection of fluid in the abdomen unless there are clear indications tapping should never be undertaken light heartedly, because in hydraemic nephritis there is pronounced hypo-proteinaemia so also to a lesser degree in ascites of cirrhosis[8] of liver, and in such a case to drain out a few pints of protein-rich body fluid is a question which should not be taken very lightly. A genuine case of cirrhosis of liver will seldom stand more than a few tapping.

Besides others the following are the indications of paracentesis abdominis.

1. Cardiac or respiratory embarrassment not relieved by ordinary means, 2. when rales appear at the base of the lungs due to their compression. 3. when urinary output is materially diminished and there is persistent oedema of the dependent parts, 4. persistent haematemesis may be relieved by paracentesis as this is likely to reduce the venous engorgement.

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8. Myers and Keeper, (1935), Arch of Internal Med. 55: March, p. 349.

Care should be taken to see that the patient's bladder is empty otherwise there is the risk of puncturing it. The intra-abdominal pressure is increased by tightening a bed-sheet round the patient's abdomen, otherwise with the sudden relief of pressure by draining of the ascitic fluid he may bleed into his own splanchnic vessels and faint or even collapse. A dose of stimulant mixture given initially may also be of use for this purpose.

It is quite expedient to give the patient ammonium chloride in twenty to thirty grains thrice daily and render the urine highly acid before tapping the abdomen. As soon as the fluid is drawn out, the injection of the test dose of neptal is given, provided the kidneys are healthy. Neptal is repeated according to indication and this prevents a rapid reaccumulation of fluid in the abdomen. It is futile to expect diuretics to act, where all the while the heavy pressure of the fluid is pressing on the renal veins causing congestion of the kidneys, hence the importance of giving diuretics when the pressure is relieved partially or completely by paracentesis.

Surgical Measures. By Talma-Morrison's operation and its modification, one tries to fix the omentum on an artificially made raw area on the under surface of the anterior abdominal wall. The idea is to establish a vascular connection between the vessels of the peritoneum with those of the anterior inner surface of the abdominal wall, so that the obstructed portal blood might drain through the abdominal blood vessels to the heart. The earlier the operation is done the better. Grave cardio-renal disease or jaundice contra-indicate this operation being undertaken.

Sometimes, inspite of good drainage of the portal blood, there may be symptoms of systemic intoxication, because the portal blood normally gets detoxicated in its passage through the liver before reaching the heart. Here the blood goes direct, hence the detoxicating action of liver no longer being in action symptoms of poisoning may be evident.

HYPERTROPHIC BILIARY CIRRHOSIS

Treatment. This is done in the lines of jaundice. The bowels should be kept regularly open by salines and a salicylate, urotropine, glycocholate mixture as given in jaundice should be prescribed.

Dilute hydrochloric acid after food may do some good. Non-surgical drainage of the gall-bladder may be of definite use.

Diet etc. should be given as in cases of jaundice.

As some persons believe the spleen to be incriminating organ hence, they advocate tying of the splenic artery.

Most important, items are the eradication of the probable causes of this disorder.

CHAPTER LIX

CHOLECYSTITIS

Diagnosis etc.

During the acute attack, cholecystitis may show fever, pain and tenderness in the region if the gall-bladder with or without vomiting, nausea, constipation, jaundice and so on. Sometimes the clinical features of the disease may bear little relation to the severity of the pathological process.[1]

In the chronic stage associated with gall-stones or not, in the absence of stone there may be found on deep inspiration a palpable and tender gall-bladder. Murphy's sign may be positive, and skiagram shows a filling defect under cholecystography. Levenes sign[2] (1933) consisting of tenderness in the eighth and ninth right costal angle, may be positive in cholecystitis.

In the acute stage or when pus has formed there is in addition leukocytosis, chill, perspiration, anaemia, and other classical signs and symptoms of pus under pressure.

TREATMENT

Consists specially in acute cases rest in bed, preferably in Fowler's position,[3] locally warmth and fomentation, hot water bottles, poultice, cataplasma kaolini and so on. The bowels should be kept open by salines preceded by divided doses of hydrarg subchloride. The mixture used in cases of jaundice for helping drainage of the gall-bladder containing salicylates, urotropine, glycocholate or taurocholate of soda, purgatives etc. is of service. Vomiting should be allayed by all the ways and means described under the treatment of corresponding conditions in black-water fever, cholera, etc. In acute cases vomits may prevent oral medication and ad-

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1. Taylor, (1936) Surg. Gynecol and obst; Sept. p. 298.
2. Medical Annual, (1933), Chronic cholecystitis.
3. Cosbie Ross, (1936), Lancet; Feb. p. 251.

ministration of food. In such patients glucose and fluids should be given subcutaneously, or rectally by drip method or per vein.[4]
value.

Dilute hydrochloric acid after meals may prove of

Diet should be as in patients of jaundice. Lactic acid group of bacilli may be useful. Amongst fruits, "bael" "papita" are of good use. The patient, specially in chronic cases, should avoid all fatty, rich meals. Proteins should be taken in moderation.

Streptomycin injections may be quite effective, for details see page 69.

Sodium glycocholate and taurocholate, are sometimes useful and act by helping the drainage of the gall-bladder. *Non-surgical drainage* of the gall-bladder may be of value. This should be done regularly and for some time till the patient is much relieved or cured. *Decholin*, injections or orally may do good.

A very important consideration is the *removal of the sepsis* which most commonly resides in septic teeth, tonsils appendix, intestines, and so on.

The patient should lead a *regulated life* on a simple but square diet containing all vitamins, having less of fat and reasonable amounts of protein, to be proportioned according to the digestive and assimilatory power of the individual. Some form of moderate physical exercise appears of use, notably to prevent recurrences. The septic foci should be made known to the patient so that he can take care of them. Drinking of plenty of water and fruit juice may be useful. Constipation is bad and should be avoided, preferably by saline purges, preceded wherever possible by hydrarg subchloride in divided doses.

CHAPTER LX
GALL STONES
(Cholelithiasis)

Diagnosis etc.

Gall-stones are more common in females than in males. It is rare before the age of fifteen. The greatest number

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4. Branch and Zollinger, (1936). New Eng. Med. June, p. 1173.

of cases occur between the ages of thirty to sixty. Infection, hypercholesterolaemia, and biliary stasis, conduce to stone formation. Fat, fair, females, at forty, with frequent pregnancies, are conducive to formation of gall stones. It appears to be less frequent in coloured as compared with white women[1,2].

The symptoms are, either continuous or intermittent dyspepsia, attacks of colic and so on. Passage of the stones in the stools may help in the diagnosis.

Gall-bladder Dyspepsia. There is pain after food or discomfort at varying intervals. That exact relation and periodicity of pain to food characteristic of gastric or duodenal ulcer lack in this condition. They may come immediately or at varying hours after meals, there is neither the regular tenderness, nor is the pain relieved by alkalies and vomiting. These findings, test-meal acid curve, occult blood test etc., all are negative to ulcer.

Biliary Colic.

Abortive attacks of biliary colic are not uncommon. Under these circumstances the patient may complain of a painful catch in the region of the gall-bladder. Murphy's sign may be positive.

An acute attack which generally comes at night or noon, may be after a heavy fatty or rich meal. The pain is excruciating, generally more on the right hypochondrium or referred to back and to the right shoulder. He is vey restless and is not motionless like a case of perforated duodenal ulcer or gangrenous appendix. There may be nausea, vomiting, quick or slow weak pulse. During an attack one may find pain, chilliness, rigor, fever etc. The duration may be from a few moments to several hours or longer. This acute pain may be followed by simple dull aches or heaviness in the right hypochondrium. Local tenderness in the region of the gall bladder and also on the eighth right costal cartilage is noted. Rigidity of the abdominal muscles, impaired mobility may persist for the time being or longer, specially when the case is one of unusual severity. Jaundice, though common is not an invariable features of this colic.

By palpation in about half of the cases one finds a tender palpable gall bladder. Skiagraphic examinations after oral

1. Illingworth, (1936), Edin. Med. Jour. Aug. p. 481.
2. Brebner, (1934), Jour. Med. Assoc. S. Africa. Dec. p.867.

administration or intravenous injection of tetraiodophenol-phthalein[3] are of use.

Complications. Secondary infection of the inflamed gall-bladder is frequent. Suppuration of the reservoir with fistulous comunication, later on leading to adhesions etc., are not uncommon. The pancreas may be chronically or very acutely inflamed, the latter leading to haemorrhagic pancreatitis and fat necrosis etc. The impacted stone leads to regurgitation of the bile along the pancreatic duct causing the above pathological state in which pain, collapse, cyanosis, vomits and jaundice are common.

TREATMENT

Colic. Usually the pain is so severe that after a probable diagnosis one is justified in injecting morphine in 1/6 to 1/3 gr. combined with atropine 1/50 to 1/100 grain, according to the body weight of the individual and acuteness of the signs and symptoms. Similar doses of morphine atropine may not relieve the pain as shown by Butsche and others of Mayo clinic,[4] (1936) that morphine in smaller doses tends to raise intra-hepatic biliary pressure. Glyceryl trinitrate in 1/100 gr. orally may do good.

In milder cases or in severe ones if pain still persists after morphine injection but not so acutely as before, one may give the following prescription which contains, analgesics as well as a purgative, with good results :—

Veromon	gr.	3
Luminal	gr.	1/2
Hydrarg Subchloride	gr.	1/2
Ext. Belladonna Siccum	gr.	1/4
Soda Bicarb	upto gr.	8

One powder every three hourly.

The dose of the hypnotic and analgesic may be made to vary according to indications. Saline purgatives should follow these, as free movement of the bowels is generally useful. Inhalation of amyl-nitrite temporarily and glyceryl trinitrate in 1/100 gr.[5] doses may do good in some cases.

3. Graham and Cole, (1924), Jour. Amer. Med. Assoc. 82 : p. 613.
4. Surg. Gynecol and Obst., (1936), 63 : p. 451.
5. Butche, Mc. Gowan and Halters, (1936), Ann. of Surg. 104 : p. 1013.

Calcium Chloride. Bauer and others[6] (1931) have suggested the slow intravenous injection of five to ten per cent solution of twenty c.cm. of calcium chloride for the relief of biliary and renal colic. Recently calcium chloride intravenously has been found useful by me where morphine and atropine failed.

Warmth. Hot water bottle or hot fomentation over the right hypochondrium may be soothing. In cases of persistent vomiting one pint of *warm alkaline* water may be used, preferably through a stomach or duodenal tube, for gastric lavage. Hot bath, specially with careful application of heat locally may be of comfort.

Non-surgical drainage of the gall-bladder is likely to be effective, but should not be undertaken till the acute symptoms have subsided. In cases of protracted vomiting gastric sedatives should be given as suggested in the chapter on cholera and blackwater fever.

When intractable. As the tenth thorasic nerve on the right side supplies the gall-bladder and the larger biliary ducts, so Barker[7] (1934) suggests in his book a paravertebral injection of five c.cm. of one per cent solution of novocain to anaesthetise that nerve in cases of biliary colic. The point of the needle is to be inserted to the right of the spinous process of the ninth thorasic vertebra and is to be directed towards the intervertebral foramen.

As *infection and stasis* in the gall-bladder are helpful to stone formation, all care should be taken to prevent these. For this purposes again proper drainage of the gall-bladder by glycocholates and taurocholates, salicylates of sodium in suitable doses may be of special value. Plenty of urotropine and alkalies orally may do good, the former may be given intravenously, when sepsis of the gall-bladder is persisting. Hydrarg subchloride in divided doses at night in something like the following prescription may be useful.

Ext. Belladonna siccum	gr.	1/8
Hydrarg Subchloride	gr.	1/4
Decholin	gr.	2
Soda Bicarbonate	upto gr.	8

6. Bauer and others, (1931), Jour. Amer. Med. Assoc. 96: p. 1216.
7. Barker, (1934). Treatment of commoner diseases p. 167-168.

One powder at bed time, at half an hourly interval till four such are taken, followed in the next morning by half to one ounce of saturated solution of magnesium sulphate. Some advocate olive oil in four to ten drams thrice or more frequently daily. *Glycerine* in half to two drams, thrice daily may also be tried with some good.

Diet. This should not contain fat or undigestible or fried articles. Small meals at frequent intervals, not only do not throw an extra burden on the digestive system, but frequent meals help the emptying of gall-bladder better, than infrequent big ones. Boiled or less richly cooked articles are good. As regards other articles of dietary, one should see the chapter on jaundice etc. Fat is preferably taken in the form of olive oil. Fatty and rich meals tend to favour colic. Proteins in excess are unsuitable too for such subjects.

In cases of poor appetite a prescription like the following may be helpful.

Tr. Nux Vomica	m.	7
Soda Bicarbonate	gr.	15
Infusum Chireta	upto fl. oz	1/2

One dose half an hour to an hour before the principal meals, followed by quarter to half a dram each of dilute hydrochloric acid and glycerinum pepsin in a cupful of water, in sips, after the principal meals, may help by assisting digestion.

Preventive measures. The principles involved in this are, (1) reduction of cholesterol content of blood, (2) promotion of the flow of bile and increasing its fluidity and render it anti-septic, (3) to try to disinfect the gall bladder.

Diet. All cholesterol rich food such as milk, yolk of egg, cream, liver, sweet bread, kidneys, brain, need be forbidden. Fats to be given in strict moderation. Fried things are badly tolerated. Frequent, simple meals, of boiled meat, fish, vegetables, and carbohydrates are safer. Glucose alkalies and calcium rich diet are to be aimed at, notably to counteract any damaging effect of jaundice on the liver.

Drugs. Potassium iodide in two to five grains or extract thyroid siccum in one to two grs. thrice daily, decrease the cholesterol content of blood. Calomel, bile salts, and some of the patent cholagogue purgatives like mycol or felamine or tablets of bile-salt, in the form of decholin, thrice daily may promote drainage of the gall-bladder. Hexamine and salicylates with alkalies are useful for this

purpose. Injections of urotropine or decholin intravenously with or without glucose may be useful.

Purgatives. Saline purgatives and their combinations like the following may be of use. It is used for its cheapness by some hospitals.

Sodium Sulphate	gr.	30
,, Phosphate	gr.	30
,, Salicylate	gr.	10
,, Bicarbonate	gr.	20
,, Benzoite	gr.	10
Spirit Chloroform	m.	10
Glucose powder	gr.	20
Peppermint water	upto fl. oz	1 ✓

one dose twice or thrice a day, is curative as well as preventive.

Clothing. Specially for ladies all tight lacing etc., should be forbidden. Bending and stooping down may cause pain. The abdomen should be kept covered by a flannel or suitable binder as local chilling may do harm.

Mineral Waters etc. Vichy, Apenta, Harrogate water and other mineral waters may be of use due to their aperient action. The patient should be encouraged to drink plenty of water. In suitable cases alkaline drinks with glucose may be of use.

Physical Exercise. Some form of physical exercise, even if not too vigorous, helps by preventing the stasis of bile. Moderate physical exercise is definitely beneficial.

Operative treatment. "If a gall-stone enters the common bile duct or if signs of severe infection of the biliary passages with threatened perforation or empyema of gall-bladder appear (fever high grade, leukocytosis, local signs etc.) surgical intervention becomes imperative. When operation is not imperative but is a matter of choice one will be governed by the degree to which the malady interferes with the patient's life."

"The mere presence of gall stones demonstrated by cholecystography is not in itself sufficient indication for operation.

"The death rate after gall-bladder operation is higher than that after appendectomy. Moreover many patients who have gall-stones or the gall-bladder or both removed may continue afterwards to have many symptoms that are very troublesome (due to the development of stenosis of the

biliary passages, to pylorospasm, to formation of stones in dilated common duct or in the hepatic duct or to secondary pancreatitis)"[7]

Cancer of the Gall-Bladder is diagnosed by gradually intensifying deep jaundice as days pass on. Cachexia in the elderly, with mass in the right hypochondrium may mean cancer of the gall-bladder and may be indistinguishable from cancer of the head of the pancreas.

The treatment is mainly as indicated above, but this is only a palliation. Early surgical interference may do some permanent good.

CHAPTER LXI

RECENT IDEAS ON THERAPEUTIC AGENTS IN LIVER DISEASES.

We now know more or less definitely that cirrhosis of the liver, once thought to be an incurable condition is amenable to therapy provided we can diagnose it in the early precirrhotic stage. With adequate supply of lipotropic[1] amino acids like methionine[2] choline,[3] cystine etc. found in good proteins specially in milk casein, etc. and adequacy of vitamin B complex when given orally, the deposited fat in the liver is absorbed and replacement fibrosis and thus cirrhosis is prevented. Recent encouraging reports on actual patients have verified the above as already reported.[4] *Methionine* has also been found useful in 2 g doses 4 times daily in the treatment of liver damage caused by poisoning by carbon-

1. Fagin et al (1943) J. Lab. and Clin. Med. 28: 987-993.
2. Miller and Whipple (1942 Nov.) J. Exper. Med. 76: p. 421-435 also Nutrition Rev. (1944 Nov.) 2 : p. 340-342 Ibid. 4 : (1946 Jan.) p. 27-28.
3. Mateer et al (1947 March 29) Jour. Amer. Med. Assoc. 133 : p. 909.
4. Blumbery and McCollum (1941 June 20) Sci. 93 : p. 589.

tetrachloride[5] or organic arsenicals. But methionine and choline appear to exert not much beneficial effect on the liver of infective hepatitis.[6]

Lipocaic and Inositol,[7] *Lipocaic* is a lipotropic substance of pancreatic tissue effective in preventing the fatty livei which develops in depancreatized dogs maintained on insulin. *Inositol* a component of vitamin B complex is also an essential fraction of the phospholipid lipositol. They also would be worth trial in hepatic diseases characterised by the deposition of fat, though not much is known yet of their effect on actual patients. The following are mainly taken from the very useful article by Wilbur,[7] with adjustments and changes :

Protein—Until recently the importance of an adequate intake of protein in liver diseases was not stressed. As a matter of fact only a decade back the very suggestion of a high protein diet in liver diseases would be considered even injurious. Besides the importance of supply of amino-acids already stressed, Ravdin[8] has pointed out that the essential elements of the optimum diet for treatment of diseases of liver are in high caloric content, approximately 3000 calories with minimum 17 to as much as 30 per cent of protein 70 per cent of carbohydrate and minimum of fat. He has further emphasized that an unbalanced high carbohydrate diet may lead to a high lipid as well as glycogen concentration in the liver and that such a liver would be vulnerable to hepatic injury as if its glycogen content was low. Now a days most workers advocate 150 to 250 g of protein daily for the treatment of hepatic diseases and in insufficiency of the liver function. In America a suggestion is being made to supply part of this large amout of protein from beef-serum albumin.[9] Whipple and his associates[10] have shown that when the diet contains certain ten essential amino-acids indispensable for the growth of young animals, the *rate of*

5. Beattie et al (1944 Feb. 12) Brit. Med. Jour. 1.0. 209-211.
6. Hoogland and Shank (1946 March 9) Jour. Am. Med. Asso. 130: p. 615-621.
7. Wilbur (1947 June 14) Ibid 134: p 598-603.
8. Ravdin (1939 March) Ann. Surg. 109: p. 321-333.
9. Watson (1944 March) Am. J. Clin. Path. 14: p. 120. 137.
10. Madden. Whipple et al (1945 Aug.) J. Expr Med 82: p. 77.

production of plasma protein was good. But lack of any single one amongst them tended to retard this process, sometimes materially, unless the same was supplied in due course.

Other interesting studies by Whipple and his group have developed the concept of "dynamic equilibrium" of the protein.[11] The idea suggests a ready out-flow of plasma proteins out of the circulation into the tissues and vice versa. As has been stated "it is their belief that the liver is concerned with the production of many of the plasma proteins and with maintenance of the normal level of these proteins in the circulating blood. The liver in other words is the master organ for various protein metabolic activities. It stores protein, it makes proteins like fibrinogen, prothrombin, and other globulins and albumins and it aggregates amino-acids and other nitrogenous materials from the gastro-intestinal tract into protein."[11] It is also concerned directly or indirectly with the production of new haemoglobin also. Further work in the line seems to indicate that animals placed on a low protein diet with hypoproteinaemia appear to show impairment of hepatic function in parallel with the decline of serum albumin.[12] Hence in our people in India sharing a very protein poor diet, is it unlikely that cirrhosis of liver will be frequent? As a matter of experience we find it rather common inspite of the fact most such subjects are total abstainers, thus falsifying our old ideas about aetiology of cirrhosis of liver caused by alcohol etc.

Protein loss in catabolism under stress and strain :

In fractures, burns and infections specially studied in meningitis, virus pneumonias, etc. protein catabolism depends on the intensity of the stimulus and the capacity of the organism to respond to such stimulus.[13] The great extent of such loss can be judged to some extent from the fact that in six fracture patients' studied revealed a protein loss of 220 gm. of nitrogen which expressed in normal muscle protoplasm amounts to 15 pounds and that loss continued till about 35.6 days.[14] These losses are best made good of by supply of adequate amounts of first class proteins given orally. Parenteral routes appear not so useful, as recently

11. Fink et al (1944 Dec.) Ibid 80 : p. 455-475.
12. Goettsch et all (1942 June) J. Biol. Chem. 144: p. 121-134.
13. Nutrition Rev. (1945 Aug.) 3 : p. 253-256.
14. Cuthbertson (1942 April 11) Lancet 1 : p. 433-436.

amigen (Mead Johnseon & Co.) and "parenamine" (F. Stearns & Co.) etc. which are protein hydrolysates and other amino acids are being given parenterally, but appear not so efficacious as when given per oral route.

Carbohydrates. That carbohydrates are useful in large amounts as a therapeutic measure in diseases of the liver is so well established and recognised that further discussion appears useless. It should be supplied liberally as glucose to the extent of about one pound daily and that orally.

Vitamin A. In hepatic diseases the plasma values for vitamin A are usually lower and also the amount stored in the liver lesser than normal. Even when given by injection enormous doses of vitamin appear not to raise the plasma level of A vitamin content in diseases of the liver.[15] "To date it seems likely that the only clinical value of the study of Vitamin A metabolism in hepatic disease is as a dignostic test."[7]

Ascorbic Acid, experimental evidence suggests that it exhibits protective action on the liver against hepatotoxic agents, at least against some of them.[16]

Medicinal Toxic agents may be rendered innocuous by liver (a) being excreted unchanged in the bile (b) by being broken down by the liver (c) synthesized or conjugated to form innocuous compounds or be stored.[17] The conversion of ammonium salts into urea is the most important detoxifying action of the liver. Besides the usual power of detoxification when those substances like good protein from milk casein etc. supplying the lipotropic amino-acids, and other vitamins specially B complex at the exclusion of excessive amounts of fat, are stored in the liver, there is certainly a favourable response, noxious substances. In *arsenotherapy* the intoxication appears more an *individual sensitivity than* on the quality of the drug administered. *Jaundice* commoner in neoarsphenamine therapy of syphilis is least among those receiving arsenoxide.[18] *Sulphonamides* appear to be toxic only in cases of portal cirrhosis and not otherwise, on the contrary hepatic damage due to microbes sen-

15. Abels et al (1942 Feb.) Ann. Int. Med. 16: p. 221-240.
16. Beyer (1943 March) Arch. Int. Med. 71 : p. 315-324
17. Clark (1942) Applied Pharmacology 7th Edn. J. & H. Churchill Ltd.
18. Mitchell (1943 Feb.) Canad Med. Assoc. J. 48: p. 94-96.

sitive to sulphonamide therapy improves under sulphatherapy.[19] Cinhophen seems to produce a decided temporary depression of synthesis and secretion of cholic acid and further that despite recovery of this function death could occur.[20] Quinine appear to be metabolised and even properly altered and destroyed by the liver. *Thiouracil* seems to prevent or retard experimental cirrhosis in rats.[21] Administration of *sodium glycocholate and taurocholate* orally increases the production and flow of bile,[22] but aloe, podophyllum resin sold in the common "*Carter's little liver pills*" have no detectable effect on the formation of bile by the liver, the evacuation of the gall-bladder and the passage of bile into the duodenum.[23]

Many *hormones* are inactivated by the liver.[7] The action of *excess of thyroid activity* on the liver is not yet definite but so far not much toxic effects have been noted, except under anoxaemia produced artificially, they both (hyperthyroidism and anoxaemia) when are combined lead to some hepatic damage.[24] It is very interesting to note that in 6 out of 7 cases intramuscular injection of 0.4 to 1.0 c.c. of epinephrine appear to increase the estimated hepatic blood flow as much as 300 per cent, if corroborated by subsequent workers will be a very significant fact in medicine indeed.[25]

Miscellaneous agents like injection of *gamma globulin* in 10 c.c. doses in adults and in 0.08 c.c. per pound of body weight in children, given intramuscularly proved effective in preventing and attenuating infectious hepatitis to the persons exposed and in the affected.[26] Injection of *liver*

19. Peterson et al (1943 Nov.) Arch. Int. Med. 72: p. 594-612.
20. Annegers et al (1944 Jan.) Ibid 73 : p. 1-6.
21. Gyorgy and Goldblatt (1945 Nov. 2) Science 102: p. 451-452.
22. Ivy (1944 July) Gastroenterology 3 : p. 54-57.
23 Ivy et al (1945 July) Ibid. 5 : p. 27-33.
24. Drill and Gunn (1944 Dec.) Endocrinology 35: p.477-482.
25. Bradley (1946 May 27) Paper read at meet of Am. Soc. for Clinical Investigation.
26. Stokes and Neefe (1945 Jan. 20) J. A. M. Assoc. 127 : p. 144-145.

extract again in cases of infectious hepatitis and other hepatic damages were found useful, increasing appetite and thus caloric intake also.[27] The crude extract with more of B complex in it, appears better for these purposes than the refined antipernicious anaemia factor alone. Agents used for the control of ascites and oedema such as esidrone, neptal etc. and diuretics appear to have no appreciable effect on the liver. Histamine injection in 0.36 to 0.6 mg. doses intramuscularly may have a doubtful increase of hepatic bloodflow as in the case of adrenalin injections. It is *another interesting* fact that " the well known effect of the aniline dye butter-yellow (P-dimethylaminoazo benzine) in producing hepatic tumours in rats can be effectively modified by the use of protective food including liver, yeast, milk and mixture of certain grains. In 1944 Opie[28] demonstrated that fat in diet accelerates the production of hepatic lesions by this dye and that when the quantity of fat in the diet is small few tumours are produced."

COMMONER DISEASES OF METABOLISM

CHAPTER LXII

BRIEF CONSIDERATIONS ON DIET & METABOLISM

(Including Vitamins and their Deficiencies)

With the extraordinary progress in the science of dietetics from physiological, bio-chemical, nutritional and other aspects, big strides are being made in the advanced countries by the practical application of this knowledge for the improvement of their national health.[1] But in our poor country even the rudiments of the well established basic knowledge are not being even partially utilised for the benefit of the people with the result that these improperly nourished, resistanceless persons are falling victims to all sorts of diseases, to which a more scientifically fed nation is not likely to be susceptible.[2]

27. Hoogland (1945 Oct.) Bul. New York Acad. Med. 2: p. 537-556.
28. Opie (1944 Sept.) J. Expt Med. 80 · p 219-230.
1. Sherman, (1929), Chemistry of food and nutrition. 3rd Edition MacMillan.
2. Mc Collum and Simmond, (1930). Newer knowledge of nutrition. 4th Edition. Mac Millan.

The usual dietary of most of our countrymen is far from adequate. The striking defects appear, in the lack of easily available protein mostly of animal origin, so also in mineral and vitamious elements.

The following points are worth emphasising.

Proteins.

A sufficiency of proteins whence are derived about twenty-four individual uptil now known amino-acids, which the human body is incapable of synthesizing from any other food material is essential. The vegetable proteins are not capable of supplying all these to the human system. They are essential for adding of building stones during the process of repair to the worn physique. The best animal proteins are supplied through meat, fish, milk, eggs, cheese etc. But they are rather expensive articles of diet hence the difficulty in procuring them specially by the poorer section of people. In association with some amount of animal protein Soyabean and similar food may supply protein need also. Animal protein builds albumin and vegetable protein goes to form globulin fraction of human blood. Cheese is a good food consisting of, protein, fat, and is rich in calcium.

To make the dietary list approach adequacy in proteins, one egg, one pound or half a seer of milk and about four ounces of meat or fish are the minimum daily requirement. For the vegetarians more of milk and milk-casein, though may take the place of other animal proteins, yet are probably as suitable as meat or fish. The recent researches in the nutrition laboratories of India, have shown that even skimmed milk in small amounts is to some extent sufficient to supply the mineral and partly protein requirement of the growing system of young people.

When appreciable amounts of protein are taken with a disproportionately big amount of carbohydrate ration, as is done in our country, the absorption of the proteins is either lesser or very little. Here comes the importance of a balanced dietary.

In lack of sufficiency of protein in the diet specially if allowed to continue long, not only the growth and development is improper in the growing persons, even in the grown ups there may be, weakness, anaemia, lack of energy, vigour, initiative, originality power of leadership etc. Hence the importance of these practical aspects of the knowledge.

"The protein intake has been shown to be important in relation to resistance to disease. Protein depletion decreased the capacity to form antibodies and this rapidly improved when high quality protein was available. Physical trauma appeared to induce a phase of vigorous protein catabolism which might be largely controlled by the addition of methionine to the diet."[3]

Dificiency of good protein and B complex in diet appear to conduce cirrhosis of liver. See also pages on cirrhosis of liver, p. 466.

Fats and Carbohydrates. These are mostly of fuel value. Good types of fat are rather dear, hence the poorer people cannot take enough for their requirement. To give good looks and for the supply of heat, energy and some vitamins, fats should be taken, preferably, as cream or butter in one to two ounces or one-fourth to half chittack, daily. Specially for the thin people this requirement should be increased. Butter and cream are good sources of fat. The vegetable fats are of numerous types and are cheaper, but not so good for nourishment etc. Over indulgence in these articles of diet may lead to obesity, diabetes, hypertension etc.

Mineral elements etc. Besides few of lesser importance, there are about eleven in these series. They are, sodium, calcium, potassium, magnesium, chlorine, iodine, phosphorous, sulphur, iron, copper, manganese.[4] If the food and drink of a person lack in any one of them for a length of time, some defect is sure to result. It may be just a state of sub-nutrition to become manifest into frank disease later on.

VITAMINS AND DEFICIENCY DISEASES

Earlier works of pioneers in the line, such as Hopkins, Mc Collum, Funk and others showed that a sufficiency of only the proximate principles, e.g., fats, proteins, carbohydrates, minerals and water, was not adequate. In order to make it scientifically sufficient one has got to add certain substances, may be even in traces, to be called vitamins. Prolonged lack of these substances leads to definite morbid

3. Cuthbertson (1945 Dec, 8th) Brit. Med. Jour. p. 815.
4. Ross, (1933), Yale, Jour. Biol and Med. 4 : p. 499-518.

states—most of which are specific in nature. These accessory food factors probably act by helping regulation, assimilation, and ultimate utilisation of the gross proximate principles of food.

Some of these accessory food factors are present in combination with fats—hence called fat-soluble. They are—A, D, E, and K. The others are present in vegetables and other articles of diet and in contrast to the above group are called water-soluble, B^1, B^2, C and others. They are synthesised by plants and not by animals, the latter getting all their vitamins through plant food. Their deficiency though generally produces specific lesions, sometimes produces secondary and non-specific lesions as well. Usually in clinical practice one sees more of multi-vitamin deficiency than the deficiency of single one, a point to be borne in mind in therapeutic application.

FAT-SOLUBLE GROUP

Vitamin A :—The basic lesions are alteration and "atrophy of the columnar epithelium and a substitution of stratified keratinising epithelium due to to proliferation of basal cells, i.e., a keratinising metaplasia, which may be regarded as an attempt at repair following atrophy."[5,6] This partly explains the lowering of resistance to bacteria, which can easily pass through these altered epithelial barrier to the system in general, thus causing septicaemia under trivial local infections which could be easily resisted to by a normal individual without such changes in the mucous lining.

Nervous System and the Eye :—Advanced cases may develop degenerative lesions in the posterior and lateral columns of the spinal cord—as in pernicious anaemia. In this anaemia there appears (1) a water-soluble factor concerned in the regeneration of red blood corpuscles and (2) a fat-soluble factor, prolonged lack leading to the degeneration of the central nervous system. It is probably this second component lacking in prolonged A deficiency which leads to these nerve changes.

Due to alterations in the epithelium of the lachrymal glands tear is not formed, thus the normal moisture constantly bathing the conjunctive lacks, causing from mild conjunctivitis at the earlier stages to ulcer cornea with or

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5. Boyd (1938), Text-book of Pathology, 3rd edition, p. 349.
6. Sydenstricker (1939), Jour. Med. Assoc. Georgia, September, 1939, No. 28.

without infection therein. This corneal ulcer is suggested by Mellanby, to be due to loss of neurotrophic control of the ophthalmic division of the trigeminal nerve. Late effect is xerophthalmia, clinically seen as a silvery white linear band spreading to both the angles of the eye from the corneal margin. Due, most probably, to the disturbance of synthesis of visual purple there is poor vision in dim light, passing later on to nictalopia (night blindness). Bitols spots and slight brownish pigmentation of sclerae are not uncommon in such subjects. These are not rare in the poorer people of our country, though uncommon in the rich.

Respiratory system :—The early changes in the trachea and bronchi may lead to easy grafting of a pneumococcic infection with an unfavourable prognosis. The lumen of the ducts is blocked by desquamated keratinised cells, leading to bacterial activity and formation of cyst in glands—assisting development of bronchiectasis. This probably explains why some people easily develop the above lesion in the course of a chronic lung infection. In even mild rickets there is not only deficiency of D vitamin, but its associate fat-soluble A vitamin deficiency being present, respiratory and gastro-intestinal infections are not only common but are very resistant to therapy unless both these vitamins are exhibited liberally for a prolonged period in order to alter the epithelial metaplasia.

Gastro-intestinal system :—"Vitamin A deficiency may produce[7] atrophy or inflammatory changes in the oral mucosa and such alterations, in the teeth as defective (or absent) enamel and dentine formation. Diarrhoea is not an uncommon symptom." While Wilbur of Standford University suggests "while anorexia, soreness of the mouth, dysphagia, vague indigestion, flatulence, diarrhoea and constipation etc. are common."

Kidney :— Renal calculi are common on a diet deficient in vitamin A, probably acting through the epithelial metaplasia making excretion of crystalline excretory products difficult. Some workers are inclined to class renal calculi in the group of the deficiency diseases.

Blood Vessels :—For the optimum health of the arteries this vitamin appears necessary.[8]

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7. Wilbur (1939), Am. Jour. Digest, Dis. 8th Nov. 1939, pp. 610-617.
8. Castex (1940), Jour Am. Med. Assoc. September 21, 1940, p. 1034.

Skin :—There is lack of sweat with undue dryness of the skin. Hyperkeratosis of the hair fallicles is common too.

Growth :—The want of vitamin A prevents the optinum growth of young growing persons.

Reproduction :—Degeneration of the seminiferous epithelium leads to testicular metaplasia with loss of reproductive power.

Chemical nature, storage, source, etc :—It is C^{20} H^{29} OH located in the unsaponifiable portion of fats and as a provitamin, (B-carotene, C^{40} H^{56}) is derived through carrots, spinach etc. Moore has demonstrated that animals can synthesise and store this vitamin in liver through the action of an enzyme from vegetable food. Cooking by prolonged heating in contact with air appreciably destroys it, whereas by cooking in covered vessels very little is lost. It is present in abundance in all forms of leafy vegetables, halibut liver oil, codliver oil, yellow of egg, butter, cow's milk, yellow fruits, etc. It is not stored in body-fats but may be stored in the liver. Daily need is 35, to 100 thousand units, (American units).

Vitamin D[9] :—The lack of vitamin causes rickets and its associated phenomena. Probably independently of parathyroids, it acts by increasing the solubility in blood and absorption from intestines of calcium and phosphates. If inadquate, the calcification of the proliferating cartilages at the epiphyses is interfered with, resulting in too much osteoid tissue without corresponding calcification,—the main morbid change in bones in rickets. There appear five groups of factors operating in this deficiency state,—they are calcium phosphate, vitamin D or irradicated ergosterol, a very potent D factor, sun's rays, or ultra-violet rays—absence of anyone of them may be conducive to rickets. As this vitamin is essential for proper development of bones and teeth, the salutary practice in our country of exposing the anointed baby to the sun's rays is extremely scientific which act by activation of the ergosterol under the skin of every human being.

In rickets, deficiency of vitamin A—the associate of vitamin D, both being fat-soluable, is *probably responsible for the vulnerability to infection of the respiratory and gastrointestinal systems of the rickety child. It is said to be useful also in osteomalacia.*

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9. "Vitamins," Med. Re. Councils Specl. Report (1932), No. 167.

Chemical nature, source, etc.—The most prominent of the vitamin D are D^2 and D^3. D^2 is calciferol ($C^{28} H^{43} OH$) the vitamin produced by irradiation of ergosterol, and D^3 is isolated from fish-liver oil or derived from the irradiation of 7-dehydrocholesterol.[10] D^3 has the same absorption spectrum as calciferol and the same antirachitic value for rats, but it is considerably more effective for chicks than the ergosterol derivative. It is believed that the common form of vitamin D in animal products and also the one produced by the action of sun's rays or ultra-violet light on the skin is D^3 present chemical and physical tests cannot distinguish between D^2 and D^3.

Vitamin D is plentiful in cod-liver oil and is also present in butter, cheese, milk, eggs, etc. It is thermostable. Daily need varies from 1,200 to 60,000 United States units.

Hypervitaminosis—of vitamin D is a real clinical entity. It may lead to constant or frequent emesis, calcareous deposits in renal tubules, pelvis of the kidneys and in the arteries.

Vitamin E:—It is a fat-soluble vitamin, deficiency of which causes in males—improper formation or degeneration of the spermatozoa, leading finally to degeneration of the entire seminiferous epithelium. In females, probably through pathological changes in placenta during early gestation, causes repeated miscarriages. Recently Wechsler[11] and others[12] have shown that alpha-tocopherol, or vitamin E produces a beneficial effect occasionally on persons with amyotrophic lateral sclerosis. An injection of 500 mg. in oil was effective, at least temporarily, in relieving neuromuscular symptoms, roaring in the ears, insomnia, anorexia, etc. in subclinical varieties of pellagra, beri-beri or riboflavin deficiency. These studies are yet in the experimental stage.

Chemical Nature, source, etc.:—Chemically it is alpha-tocopherol, abundant in the unsaponifiable portion of wheat-germ oil; to a lesser extent present in meat, growing green leaves, cereals, specially when germinating. It is comparatively stable.

Vitamin K:—It is fat-soluble and is essential for the maintenance of a normal concentration of prothrombin in the

10. Monk, H. E. (1932), The Analyst, 67 : p. 83.
11. Wechsler (1940), Jour. Am. Med. Assoc. No. 114, March 16 : p. 948.
12. Spies and Vilter (1940), South M. Jour. No. 33 : June, p. 663.

blood.[13,14] Animal experiments and clinical studies have shown that certain haemorrhagic tendencies are due to deficiency of vitamin K with a low prothrombin content of blood. The hitherto known grave "haemorrhagic diseases of the newborn"[15,16] are very ably combated by it. So also it is now possible to undertake surgical operations in jaundiced patients under its use. To ensure proper assimilation, presence of adequate amount of bile in the intestines appears more important than sufficiency of vitamin K in the diet; hence the greater efficacy of parenteral therapy. If given orally, it should be coupled with bile salts. Its deficiency is met with in conditions where lack of bile in the intestines is well marked. Recent indications of its use are found[17] (1) in cases of maternal toxaemia, (2) premature labour, (3) in cases of difficult or instrumental delivery, (4) where breast feeding is not possible, (5) in development of cerebral symptoms during the first few days of life, (6) in cases of haemorrhagic diathesis, icterus gravis neonatorum, and anaemia, and (7) where an operation is contemplated on a newborn. Liver appears to be the main seat and store of it.

'Synkavit' and 'Kapilin' injectable commercial preparations are very useful in urgent cases. Daily need is about one mg. Daily administration of 2 mg. of menadione is sufficient in late stages of pregnancy.

Water Soluble Group

Vitamin B^1 : *Aneurin* : *Thiamine chloride* (1936)[18]—Though widely distributed, much of it is lost through refining and making natural food artificial—as by polishing rice too much and also by making flour white. It is essential not only for the nerves (aneurin) but also for the health of gastro-

13. Waddell and Lawson (1940), Jour. Am. Med. Asso. October 26, Vol. 117, No. 17—for many other references see this article, p. 1416.
14. Waddell and others (1939), Proc. Soc. Exper. Biol. and Med. March, No. 40, p. 432.
15. Kelly, Orville and Bray, (1940), Jour. Lab. & Clin. Med. February, pp. 527-430.
16. Hellman and Shettles (1939), Bull. Johns Hopkins Hospital, July, 65 : p. 138.
17. Macpherson, McCollum and others (1940), Brit. Med. Jour., 1 : p. 839.
18. Spies, Hightower and Hubbard (1940), Jour. Am. Med. Assoc., July 27, Vol. 115 : p. 292.

intestinal system and for the best action of the mind. This vitamin is poorly represented in the diet of almost all civilised people. "Half of England's people are said to be lacking in it." According to Fantus in America[19]—"the intake of Vitamin B even of the well to do, probably allows little if any margin of safety."[20]

Early changes in avitaminosis of B[1] are loss of appetite, strength and weight, periodic vertigo, burning sensation of various parts of the body, nervousness, numbness, loss of sensation of extremities, cramps, tenderness of muscles, etc. Mental changes[18] like moodiness, sluggishness, indifference, fear, mental and physical fatigue, etc., are common. "The states of mind and body observed in these subjects were such as would be least desirable in a population facing invasion, when maintenance of stamina, determination and hope may mean defeat or successful resistance." From the standpoint of dietary of a nation engaged in warfare this vitamin is of great value indeed.

Carbohydrate Metabolism[19]—B is an essential component of many varieties of living cells, and is universally needed. It is responsible for the metabolism of pyruvic acid an essential stage in the disintegration of the carbohydrates. That pyruvic acid is an intermediary, could be proved by the fact that in human beriberi and in animals deficient in vitamin B it accumulates in blood together with lactic acid and disappears upon this vitamin being given, the greater the need of it is for those organs like brain, nervous system, heart and kidneys which utilise comparatively greater amounts of carbohydrates.[21] Beriberi might have some intricate relation with pyruvic acid intoxication. According to Fantus, "The body requirements for vitamin B are thought to be proportional to the metabolic rate and the non-fat calorigenic (including alcohol) intake. A person who refrains from all food needs little vitamin B. A diet high in refined carbohydrates increases the need for thiamine."[20]

Hence it is useful in diabetes mellitus.

Beriberi[22] affects mainly peripheral nerves and cardiovascular system, symmetrical peripheral neuropathy, accom-

19. Editorial (1940), Ibid., October 5 : p. 1198.
20. Fantus (1940), Ibid., August 10 : p. 450.
21. Proc. Roy Soc. of Med. (1939), Brit. Med. Jour. January 21, p. 129.
22. Harmano and Eubanos (1935), Philip. Jour. 57 : p. 277.

panied by degeneration and atrophy of the affected muscles supplied by the affected nerves. The cardiovascular disturbances include oedema, cardiac dilatation, speeded circulation, high venous pressure and prolonged electrical systole.

Intestinal tone and musculature—For the upkeep of the optimum health of the involuntary muscle and the intestinal mucosa this vitamin also appears to be of some use.

Neuritis, etc.—It is more or less established that all sorts of neuritis[23] including alcoholic neuritis and those caused in diphtheria, pellagra and other deficiency states are easily relieved by adequacy of this vitamin. Some go so far as to suggest that if there is enough of B in a person's diet, production of neuritis by alcohol is well nigh impossible. There is some truth in this assertion. In the subclinical varieties, exhibition of B increases appetite, strength coupled with a sense of well-being, and with complete relief of early neurological and cardiovascular symptoms of beriberi.

Chemical Nature, Source etc.—Chemically it is thiamine chloride (C^{12} H^{16} ON^{4} 2HCL). In England it is known by the name of aneurin. B-complex is widely distributed in seeds and unhusked cereals, and liver, kidney, etc. of animals. Yeast and marmite are rich sources of it. There are far more numerous subjects of subclinical beriberi with constipation and gastro-intestinal sub-health with or without cardiovascular manifestations than we suppose. This is all the commoner amongst the poor middle class of our country who like the poor village folk cannot take suitably prepared unpolished rice and other raw vegetables and fruits, probably being more a victim of custom and civilization—which tend to make natural food artificial by too much refining. Benerva (Roche) Berin, Thiamine etc. are commercial preparations. Daily need is 20 to 30 mg.

Vitamin B^{2} Complex : *Nicotinic acid or its amide* :—Its lack produces the well-known clinical condition called *pellagra*. The lesions, in short, are :—

Alimentary—Swelling and redness of the margins and tip of the tongue. *The epithelia are shed down and the tongue ultimately looks shiny, glazed, raw and dry. Stomatitis, gingivitis and pharyngitis* progress in an orderly manner. Nausea, vomiting, ptyalism, diarrhoea (sprue ?) and

23. Aring and Spies (1939), Jour. Neural and Psychiat. October, 2, pp. 335-360.

and abdominal discomfort are advanced intestinal symptoms of the disease. These patients of pellagra are unduly sensitive to insulin.[24]

Cutaneous—Symmetrical lesions on the exposed parts of the extremities—at first erythematous resembling sunburn, then to reddish brown desquamation with reddening of the underlying skin.

Mental—Symptoms like apprehension, confusion, disorientation, loss of emotional control, hallucinations, mania and delirium are all advanced symptoms. Coma and unconsciousness may be important diagnostic factors later on.

Earlier symptoms[25]—such as loss of weight and strength, lassitude, abdominal pain, numbness, nervousness and forgetfulness are not uncommon. Initial nervous symptoms are hyperaesthesia to all forms of sensation, increased psycho-motor drive, anxiety and apprehension with a tendency towards depression, weariness, increased fatiguability, headache and sleepiness are typical of the prodromal period.

Chemical Nature, Source etc.—Chemically it is nicotinic acid and the main sources are as in B and also in certain proteins. Both of them are more or less thermostable. Commercially sold as nicotinic acid. Daily need being 250 to 500 mg.

Vitamin B^2 Complex: Riboflavin:—This is another component of vitamin B and useful for the chronic ulcers in the corners of the mouth,[26] i.e., cheilosis first demonstrated by Sebrell and Butler. Erosion around the eyes, and a shark-skin appearance of the nose is also due to a lack of this factor.[27] Itching, burning, and excessive dryness of the eyes, photophobia, granulation and extreme redness of the conjunctiva particularly of the lower lids are common in persons with riboflavin deficiency. They are often associated with keratitis.

Chemically—It is akin to flavins present in many tissues and are at least concerned with the oxidation processes of

24. Mainzer and Krause (1940), Acta. Med. Scandinav., Vol. 104, pp. 321-336.
25. Frostig and Spies (1940, February), Am. Jour. Med. Sci. 199: pp. 268-274.
26. Sebrell and Butler (1938, December 30), Public Health Rept., 53: p. 2282.
27. Vilter, Vilter and Spies (1939, February 4), Jour. Amer. Med. Assoc., Vol. 112: p. 420.

cells. It is also present in liver and kidney of animals, milk, yeast, eggs, etc., which are all more or less good sources of B-complex. Commercially sold under lacto or riboflavin—5 mg is the daily need.

Vitamin B^6 Pyridoxine:—The symptoms responding favourably are extreme nervousness, insomnia, irritability, crampy pain in the stomach, weakness, muscular rigidity and difficulty and awkwardness in walking.[28]

In large amount produces slight reticulocytic response in pellagra and pernicious anaemia in relapse. Intravenously it is useful in idiopathic epilepsy and amyotrophic lateral sclerosis. One case of myasthenia gravis improved within 24 to 48 hours of the injection of B^6. Jolliffe, Spies,[28] and others found pyridoxine useful in Parkinsonian syndrome of both arteriosclerotic and post encephalitic varieties and in all forms of rigidity of muscles with awkwardness of movement. It is one of the best agents to promote leukocytosis when given by injection of 100 to 200 mg.

Chemically—It is C^5 H^9 O^3 N and the sources are more or less those of B complex.

Pantothenic acid[18]—appears to have a direct relation with riboflavin, because injection of this factor raises the riboflavin content of blood.

Yeast adenylic acid[18]—appears to fortify the effects of nicotinic acid and other vitamins.

Vitamin C: Ascorbic acid: Cevitamic acid: hexuronic acid:—The essential underlying lesion is an inability of the supporting tissues to produce and maintain intercellular substances.[5,29] The effects are on the cells of mesenchymal origin in contrast with the ectodermal and entodermal effects of vitamin A deficiency. These intercellular substances concerned are the collagen of all fibrous tissues, the matrix of bone, dentine[30] and cartilage, and all non-epithelial cement substances including those of vascular endothelium. The

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28. Spies, Bean and Ashe (1930, June 10), Ibid., Vol. 112: p. 2414.
29. Crandon and Lund (1940, May 2), New England Jr. Med. Vol. 222: pp. 748-752.
30. Croft and Snorf (1939, September), Am. Jour. Med. Sc., Vol. 198: pp. 403-408.

weakening of the capillary walls is responsible for the haemorrhage which forms a very prominent feature of the disease. This may be noted in the mucosa, skin, lung, muscles, nerve sheath, under the periosteum and in the joints. Such subperiosteal haemorrhage in children of 6 months to 2 years is called—along with other symptoms—infantile scurvy or Barlow's disease. There is a marked secondary anaemia in these cases with corresponding bone-marrow and blood change, which disappears on exhibition of orange juice or lemon juice. The usual signs and symptoms of scurvy are too well-known to be enumerated here. Very recently we have learnt that adequacy of C vitamin protects the liver from toxic damages.

Chemistry, source, etc. :—Chemically, it is l-ascorbic acid ($C^6 H^8 O^6$) stored in plenty in the adrenal cortex. It is present in abundance in citrous fruits such as orange, lemon, etc., tomato, guava, mango, green leaves, etc. It is spoilt when heated long in contact with air. It is also destroyed by sodium bicarbonate and alkalies. Cow's milk contains some, a mother having fruits, etc., in her diet prevents scurvy in her child through breast milk. Modern methods of canning[31] do not cause much of C in preserved fruits to be lost. It is fairly stable in weak acid solutions. Sold as ascorbic acid or hexuronic acid or cevitamic acid and daily requirement varies from 500 to 1000 mg.

CLINICAL CONSIDERATIONS[18]

Deficiency is expected under various conditions, e.g.,—

1. Inadequate intake which might be due to (1) Poverty, (2) Ignorance of proper dietary specially of vitamins. (3) Diet used in prolonged therapy as in diabetes mellitus, duodenal ulcer, etc.,—in the former, B^1 deficiency is now said to be contributory if not a direct cause; in the latter—C and B complex deficiency plays some part. (4) In gastro-intestinal upset, cirrhosis of liver due to abuse of alcohol leads to early neuritis which has been more or less definitely proved to be due to B^1 deficiency, so also other forms of neuritis. Jaundice and lack of bile prevent absorption of all fat-soluble vitamins. (5) Absence of teeth causing failure of proper mastication prevents absorption. (6) Too much of dextrose given intravenously in a person with very little B^1 in the system might produce sub-vitaminosis of B^1.

31. Savage (1939, November 4), Lancet, 2 : pp. 991-995.

II. *Inadequate absorption in* :—(1) Persistent vomiting as in oesophageal or pyloric stenosis, hyperemesis gravidarum, chronic intestinal obstruction, etc. (2) Chronic diarrhoea and cathertic habit. (3) Short circuiting the bowels, thus reducing surface of absorption. (4) Achlorhydria, achylia and also in poverty of intestinal secretions in general which is peculiar to certain persons or families.

III. *Increased need in* :—(1) Infections, specially when long-standing as in typhoid fever, tuberculosis, chronic osteomyelitis. etc. (2) Thyrotoxicosis and other conditions of raised basal metabolism; a person in rest in bed requires lesser amount of vitamins than when he is up and about, hence the importance of rest in bed of persons suffering from deficiencies of an extreme type. (3) Pregnancy and lactation make an extra demand on vitamin need even to the extent of five times in the case of B^1. (4) Increased and violent physical exertion increases the need for vitamins.

IV. *Disturbed utilisation in* :—Persons with liver disease and jaundice cannot properly utilise the vitamins. (2) Diabetes mellitus makes B^1 more essential—the others are probably as important.

V. *Disturbed distribution in* :—Arteriosclerosis may make the distribution of vitamins to the different parts of the body unequal, the aged may require more than the young persons.

Factors of safety working during states of deficiency :—(1) The margin between chronic ill health from deficiency and slight subnutrition is wide; hence manifestations of frank illness may not appear for some time even if there is a moderate lack of them. (2) Rest in bed minimises the need for vitamins, hence all serious cases should be treated in bed. (3) Some of the vitamins are stored in the system in cases of chronic deficiency, probably a protective mechanism of the body.

PRINCIPLES OF THERAPY IN DEFICIENCY STATES[14]

General considerations :—Every case should be individualised and treated on its own merit and should receive about 4000 calories including proper proportion of proteins, fats, carbohydrates and minerals. If the patient is ill, he should better rest in bed thus reducing his vitamin need at once to the minimum. This is specially important for poorer

people who cannot afford expensive articles rich in vitamins. Specific therapeutic agents given in doses mentioned below in their respective deficiencies are indicated. Symptomatic treatment cannot be neglected.

Specific therapy:—In severe conditions concentrates of the synthetic vitaminous products are definitely indicated, because it shortens the suffering with rapid, sometimes dramatic, improvement, and assures complete recovery. Indications for therapeutic use of the synthetic vitamins and concentrates of yeast and liver are very large indeed, but indiscriminate use is not consistent with the best interest of the patient.

Deficiency of A Vitamin—is usually associated with lack of D as well as they are both fat-soluble, hence deficiency of one is likely to lead to lack of the other. Intestinal disorders, habitual purging through liquid paraffin, jaundice, chronic diarrhoea, etc. also due to hurrying out of the intestinal contents prevent their absorption hence may show deficiency. Prolonged lack leads to lowered resistance specially in children; this probably is one of the reasons why rickety children, are so very susceptible to infections of the gastro-intestinal and respiratory tracts, for which besides symptomatic treatment adequacy of A and D are essential. A vitamin is plentiful in codliver oil, butter, fruit juice, yellow of egg etc. But the available preparations containing concentrates are Adexolin (Glaxo) Haliverol (P.D.) Navitol (Squibb) which in 5-10 drops twice daily cures most of the A and D deficiency states. But they should be exhibited for weeks and months. Prepalin (Glaxo) is a very concentrated injectable form of A vitamin, but causes much pain. Failure to exhibit adequacy of A vitamin in pregnancy, in growing infants, in prolonged illness, and in jaundice preventing absorption of fat and the vitamins A, D, E and K therein and in Sippy and other special forms of dietetic therapy, specially on restricted dietary result in *conditioned deficiencies*. Besides A, vitamin C also appears necessary for cure of night-blindedness. In deficiency states manifested in the eyes and in hornification of hair follicles internal as well as locally as external application are useful. Those who can not take oily substances may take them in available capsules, best taken in empty stomach with milk or food.

Deficiency of vitamin D:—*Rickets*—the measures to prevent and cure are—1. Proper antenatal care (for details see section on diseases of children) 2. Adequacy of vitamin

D in later stages of pregnancy. 3. Regulation and proper diet of the lactating mother and the infant. 4. Infections of the respiratory and gastro-intestinal tract are common in ricketv children not so much due to D deficiency as due to simultaneous lack of vitamin A also, the anti-infective factor. 5. For their cure and prevention, calciferol for D deficiency and codliver oil, shark-liver oil, adexolin, haliverol, navitol, etc. are suitable besides yolk of egg, fruit juice, good milk etc. Exposing the child anointed with some oil to the rays of the sun with suitable protection of the head prevents and cures rickets by activating ergosterol under the skin.

Beri-beri :—Acute cases are best treated by injection of the sodium compound of thiamine hydrochloride in 20 to 50 mg. a day. For these persons oral dose of 50 to 100 mg. daily in divided doses of 25 mg. may have to be pushed for rapid action. For an average case, two doses of 10 mg. each may be enough provided the intestinal absorption is intact. Injections are better for serious cases as they ensure proper dosage, absorption, etc. Children require little less but compared weight for weight with an adult, they require more. When given orally the tablets should preferably be dissolved in warm normal saline before administration. Thiamine chloride is sold under various trade names, and should be injected in urgent cases.

Pellagra :—For the average adult about 500 mg. of nicotinic acid or its amide or sodium nicotinate per day in divided doses of 50 mg. each may be enough. The sodium salt dissolved in sterile normal saline may be given intravenously in 10 to 15 mg. doses thrice or four times up to 50 to 80 mgm. daily. Severe cases may require as much as 1000 mg. to be taken orally in divided doses. It also possesses various names, like, pelonin, nicotinic acid, etc. As hydrocloric acid secretion is deficient it is supplied as on page 418 and also good protein rich diet.

Cheilosis, etc. :—Riboflavin in 3 to 5 mg. orally or intravenously in sterile solution daily meets with its deficiency. Since riboflavin is not very soluble hence it is safer for oral therapy. It has also got various patent names. *Sprue syndrome* also responds to B complex, good rich diet and folic acid in small doses. See pernicious anaemia.

Haemorrhagic diseases in the newborn :—Recently oral administration of 1 to 5 mg. of 2-methyl-1, 4-napthaquinone daily is very satisfactory. It must be given with emulsion of bile or its salts. Preparations for injections are also available

—one found useful by me is "Synkavit" and Kapilin (Glaxo) and oral use of menadione, and acetomenapththone are effective.

B.[6]—Though satisfactory results follow in some cases of its deficiency by intravenous injections in sterile saline solution, yet its general use is not recommended by workers in the line.

Vitamin E :—500 mg. injected intramuscularly suspended in sterile oil is used in its deficiency. But for average cases oral use of alphatocopherol in smaller doses is adequate. It might have to be continued for some time to correct deficiencies of generative system in both the sexes. In muscular distrophies or motor paralysis following anterior poliomyelitis big doses of E and B with smaller doses of strychnine have been found definitely useful. Ephynal (Roche) is a synthetic, Viteolin (Glaxo) Fertilol (Vitamins Ltd.) are natural wheat germ oil, effective and good sources of this vitamin.

Intravenous use of adenylic acid causes severe reaction, hence its use is not recommended at the present stage of our knowledge.

The pantothenic acid content of blood and urine of subjects of pellagra, beri-beri and riboflavin deficiency is 23 to 30 per cent. lower than in normal persons.

In mild or moderately severe multivitamin deficiency dry powdered yeast, 75 to 100 gm., liver extract 75 to 100 gm., or 150 gm. of wheat germ oil should be given orally to supplement daily diet. Yeast and wheat germ have the advantage over the pure synthetic products in that they contain, nicotinic acid and riboflavin, i.e., B^2 and B^1 and B^6. In addition these crude substances are rich in enzymes, salts and other unknown trace substances necessary for health.

Protective food.

Besides the above there are four articles of diet which are of unusual supplemental nutritive value and they are fruits, milk and its preparations,[32] leafy green vegetables and eggs. According to many workers they are *protective foods*. It is really due to the abundance of fresh vegetables, specially the leafy ones in diet, which are protecting our poorer village population, from profound malnutrition. If a little milk and an egg are added to it, most of the need excepting that for adequate protein is satisfied. Leafy vegetables contain mine-

32. McCarrison, (1936), Brit. Med. Jour. ii. p. 611.

rals, vitamins and also folic acid a component of B vitamin essential for nutrition and blood formation.

According to McCollum, one must take first what is essential for his health and active life and then he should take things to his liking. *"Eat what you want after you have eaten what you should."*

According to Lucy Gillett[33] (1933) the following distribution of the purchase money spent for ration should be prudent.

(1)	Fruits and vegetables	one fifth
(2)	Milk and Cheese	one fifth or more
(3)	Meat, fish and eggs	one fifth or less
(4)	Bread and cereals	one fifth or more

(5) One fifth or less for sugars, fat and other groceries.

Importance of square dietary.

A square dietary is of great help in raising the defensive power, through alterations and changes towards optimum functioning of the individual cells of the various structures of the body, on which resistance ultimately depends.

If to the average dietary of most of our country men are added one egg, a cup of milk, some meat, fresh leafy vegetables, fresh fruits and chapti, the usual deficiency may be covered more or less adequately.

While our economic condition, ignorance, inertia, habits, customs etc. are on the way of a reasonably sufficient, not to speak of a scientific dietary, the great workers of America are thinking on very advanced lines. Such an authority like McLester[34] (1937) remarks "Experience with albino rat has shown that by suitable additions, to a diet that previously has been regarded as adequate an entirely new race of rats of greater and larger stature can be produced. Likewise studies of population have shown that something similar can be accomplished for human race; in numerous instances improved environmental conditions, notably with regard to food, have resulted in a more vigorous, taller race of men and women. The time to improve the environment is in childhood. In our (America) public schools it is realised that the child should have optimum diet and that to secure this for him will require not only supervision, but also education of three groups the pupil, the parent and the teacher."

33. Gillett, (1933), Jour. Am. Diet. Assoc, p. 382-386,
34. Jour. Am. Med. Assoc. .1937), Sept. II. p, 838,

CHAPTER LXIII

OBESITY

In women—the dictates of fashion have set up a standard of slimness, sometimes this is carried too far by many persons and they think themselves bound to conform to this craze for slimming. Obesity is not only ugly in women, but in men too it causes discomfort and, physiological as well as physical efficiency is materially reduced. The mortality rate in these persons is higher from all infective processes as the resistance is low. They stand surgical operations badly and the possibility of diabetes mellitus and gall-stone formation in such subjects is far greater than in average healthy persons. Fatty heart, hypertension, resulting in apoplexy, arteriolosclerosis, kidney diseases, joint-troubles, are also commoner in these persons,[1] whereas too thin persons stand the risk of many infections, such as, Tuberculosis and so on. As a rule it has been found out that the habitually thin built people are longer lived and are comparatively healthy.[2] "Beal has calculated that every pound of fat requires 5/6th of a mile of blood vessels to supply it and that a man who is thirty pounds over weight is carrying around twentyfive miles of excessive blood vessels with a resultant strain on the circulatory system. Fat is a parasite and *that as we lengthen the waist line we shorten the life line.*"[3] Proger and Denning (1932)[4] showed that the vital capacity of the obese was 12 to 25 per cent. less than normal. Not only this, due to the faulty posture resulting from visceroptosis, varicose veins, tendency towards piles and stasis on the venous side are common. These are some of the diseases of the sedentary stout people.

The factors which maintain normal body weight are (1) *The food intake* though varies according to age, weight, body surface, basal metabolism rate and so on. Yet an adult woman weighing about ten stones requires about 2100 calories daily or about thirty calories per kilogram of body weight. For persons of lesser weight smaller caloric intake is indicated. If the person wants to reduce the weight

1. McLaren (1929) Medical Insurance Examn—2nd Edn, p. 193—London.
2. Rolleston (1932) Medical Aspects of old age—p. 69.
3. Major (1937) "Physical Diagnosis" Saunders Publication p. 51-53.
4. Jour. of Clin. Invest. (1932) II p. 789.

lesser calories than the above value are indicated. For this purpose the discussion of dietary under the treatment of diabetes mellitus may be gone into.

(2) *Basal metabolism* rate varies in different persons, some constitution will refuse to gain appreciably in weight, though they are given diet slightly richer than their caloric requirement. But systematic calculated diet of higher caloric value seldom fails to cause a gain in weight even in habitually thin persons.

Specific dynamic action of foods—The obese persons system often develops the peculiarity by which the specific dynamic action of proteins is much diminished. In such persons carbohydrates and proteins are more easily metabolised than fats, hence so long as any carbohydrates and proteins are available no portion of the body fat will be used. Hence the importance of giving these persons a diet low in both these ingredients of proximate principles.

TREATMENT

Physical Exercise—Brisk combustion of the food supplies the necessary energy for vigorous muscular exercise. Obese persons can hardly indulge in hard physical exercise, which when graduated and in conformity with their state of physical fitness may help in reducing body weight, provided the generous appetite given rise to by such physical exercise is not satisfied by increased intake of food. This might be of a violent type like foot-ball, basket-ball etc., for the younger otherwise healthy. But violent exercises are as a rule not suitable for the obese elderly people, for them walking, riding, golf, tennis etc. are suitable and should always be undertaken. The types of obesity have been classified by various methods. But in short it may be due to (Du Bois 1927)—

(a) Over-eating and muscular inactivity—giving rise to the exogenous type.

(b) Defect in metabolism and endocrine deficiency producing the endogenous type.

(c) But the majority of cases are a mixture of the above two, the constitutional type. But we are now learning that not only there are adipophil systems but also hydrophil systems imbibing large amounts of water, in such cases diet and fluid restriction and injections of neptal group are indicated. Whatever the type, the treatment should consist

first in the restriction of diet, to upto 900 to 1000 calories per day. A diet which may give some success in an average case, would consist of 40 to 120 g of carbohydrates 50 to 200 g of protein and 25 to 140 g of fat, all in a graduated scale. Along with it a little extract of thyroid in 1/2 to 1 gr doses, twice a day, for three to four days per week, keeping watchful eye upon the pulse rate etc. may be of use. The patient taking thyroid ext. must see the doctor once a fortnight for control of thyroid treatment.

Some important details—The ratio between carbohydrate and protein should preferably be 0.6 g to 1 g, and the total protein intake, for maintenance of good health, should not be lesser than 60 g per day. Fat should be cut down to the minimum in the daily dietary so that the stored fat in the body may supply some required energy. Appetite should be appeased by small concentrated meals, the bulk being supplied by a large proportion of fruits and vegetables of low caloric value. Salt and water should be restricted and care should be taken to give plenty of fresh fruits, vegetables. A and D vitamin in adequate amounts may easily be supplied in the recently available vitamin concentrates—of which adexolin, haliverol, navitol, vitadex etc., are examples. All vitamins may be supplied in concentrated forms in AbidolC capsules, Esdavite etc. Raw vegetable salad consisting of leafy vegetables well washed, tomatoes, onions, carrots, beet root raw are useful and are rich in vitamin and appeasing. In cases of very generous appetite benzedrine or amphetamine one to two tablets in the morning may be useful, in reducing such appetite. The patients sense of appetite may gradually be reduced partly by habit and partly by a bulky diet as suggested above. Starvation tends to reduce this generous appetite, specially effective is oral use of benzedrine sulphate.

An example of the dietary is something like this :—

Break-fast—A cup of tea or coffee with milk but without sugar if urgently required sweetend simply by saccharin. Some butter on a piece of biscuit preferably rich in B vitamin, an orange or an apple, or some such fruit which is not very sweet. At about 10 to 11 a.m. the patient may take a cup of marmite soup or a little clear soup or some fruit juice or green cocoanut water if available.

Lunch—should consist of a piece of bread, or a piece of chapati—some green vegetables, a piece of meat or fish and some cheese. Those who are vegetarians may take small

portions of preparations of lentils e.g. bora, dalmut, papadum, boiled dal of all types according to taste may be given in small amounts. For the other details the diabetic dietary may have to be consulted. Tiffin in the afternoon should be like that in the morning.

Dinner—Soup which should be clear and free from fat and a piece of meat without fat, lamb cutlet, chicken, lean fish or live fish where available without much fat, boiled cabbages, onions, cauliflowers or other leafy vegetables may be allowed. Salads, fresh fruits, raw vegetables are very helpful in making up the bulk. Here too, for vegetarians small portions of all sorts of preparations made from lentils (Dal) may be allowed—provided they are not cooked with much ghee or butter or oil. Butter and cheese may be allowed but in strict moderation. Channa in moderate amounts supplies protein need very well. Sweets, flours, fats, potatoes, rice are liable to make the patient fat. Whenever the patient's caloric intake is lesser than the energy requirement, she will certainly not gain in weight and it is likely that she will lose weight.

To *avoid constipation* one may give the patient a cup of hot water in which the juice of a lemon is squeezed out and a pinch of sodabicarbonate added and drunk while effervescing. In some cases water also may have to be restricted and cases not responding to diet and fluid restriction, may need injections of neptal group of drug's after oral use of ammonchloride.

Endogenous obesity

Thyroiditis of some degree following acute infectious diseases may be the starting point of subthyroid obesity. In some families it has a tendency to run for generations. That it has a familial tendency is proved by the fact that many people attacked with infectious diseases do not get fat. It is only in certain persons in a group of families with a tendency to get fatty that show this increase in bulk, notably after acute infections. The distribution of fat is mainly confined to the trunk. A pad of fat is distributed in a boss like manner over the vertebra prominens. They have as a rule a low basal metabolism with a high cholesterol content of blood. Their appetite is of the generous type, but this fact is often denied by the patient very stoutly. Curtailing of diet only does not cure these cases. Extract thyroid siccum in half to one grain doses initially to be increased even upto two to five grains in bad resistant cases may have

to be given twice or thrice a day, with some success. This type of obesity may be met with in both the sexes. Thyroid extract, though useful for these persons, should not be administered to every fat subject because that might throw an extra load on the already over loaded heart by a raised basal metabolism. Their weight should first be reduced by diet, then after some reduction thyroid extract exhibited.[5] Nervousness, palpitation, insomnia, diarrhoea, etc. indicate excess and need be discontinued.

Pituitary type—The best known is the Frohlich's syndrome. The juvenile form is called the dystrophia adiposogenitalis and is not uncommon. The causes are often unknown, though tumours or internal hydrocephalus may be detected. The distribution of fat is characteristic and is mainly on the breasts, abdomen, hips, buttocks and suprapubic areas.

There is a tendency in males to the feminine type of pelvis and distribution of public hair and knock-knees. If the condition starts from child-hood there is generally lack of development of the primary and secondary sexual characteristics. In a radiogram, in certain percentage of cases the sella-turcica may show enlargement or the clinoid processes may show fusion.

In females there is amenorrhoea, or very scanty periods. In both the sexes the patient is drowsy, backward in thoughts and ideas and lacks in concentration of the mind. They are as a rule backward in mathematics. Often it is suggested, not uncommonly wrongly, that puberty will cure it but this pious hope may not be fulfilled. Dercums type is an adult type of pituitary dysfunctional obesity in which antuitrin "S" injections may be tried.

Sex glands—The inter-relation between the presiding influence of the pituitary to the sex glands is too well known for enumeration. Not uncommonly the lowering of tone of the catabolic glands in persons after middle age may be the cause of deposition of fat. The climacteric in the males though less obvious than that in his feminine counterpart, is often manifested by diminished activity or atrophy of the testes, probably indirectly helping the hypertrophy of the prostate. In both sexes in advanced years, hypo-endocrinism leads to deposition of fat and lowers the basal meta-

5. Poulton (1931) Proc. Roy Soc. Med. 25: p. 347.

bolism rate with a subnormal temperature, slow pulse and a subjective feeling of excessive chilliness, etc.

Treatment—Restriction of diet as above, fluids are given in moderation. The channels of excretion such as bowels, kidneys, skin and lungs should be kept freely acting, so that the waste products may be properly eliminated. Very drastic purgation or diuresis may also help in getting reduction in body weight but they may be too weakening to the patient unless done gradually. Many patent remedies for the reduction of fat contain either strong purgatives or diuretics or both. These secret remedies are as a rule risky—notably when used for prolonged periods.

Thyroid extract in suitable doses is of great use in subthyroid obesity. Pituitary in combination with others have been used in undetermined cases, but Antuitrin 'S' an extract of the anterior lobe of the pituitary gland, when injected subcutaneously in one c.cm. doses twice a week, the Frolichs syndrome group and other subpituitary states are sometimes ably combated, and not only the patient loses weight but also secondary sexual characters improve in some.

The use of dinitrophenol is not safe and many cases of serious poisoning have been reported. Those who are interested in its use should read the literature on it which is voluminous.

Warning: One has seen disastrous results following all sorts of enthusiastic or one sided treatment of obesity, the treatment proving worse than the disease. Initially by subcaloric diet, lessened water and food intake, proper purgation and regular physical exercise the weight should be reduced gradually by one to two pounds per week. Glands of internal secretion can do much but they must be judiciously given because an excess might do a lot of harm. One of my very fat jewess young patients took one phial of 10 c.c. Antuitrin 'S' injection—one injection of 1 c.c. twice weekly to lose about 10 pounds in about 2 months. This encouraged her so much that she took three more phials (i.e. 30 c.c. in all) of injections in the above method without telling me or without my knowledge, to get extreme loss of weight palpitation and multiple furunculosis for months. Another young lady got heart trouble after too much thyroid medi-

cation. Another one got duodenal ulcer after a drastic curtailment of diet particularly in milk, egg, butter etc. So the key note in this matter is to go cautiously and judiciously in reasonable lines, and try diet, medicine, physical exercise, and glandular therapy according to individual need, tolerance, and are as important as response to therapy.

Recently Freed (1947)[6] in an article has discussed the psychic factors in the development of obesity and has raised several very pertinent psychic factors. He has suggested the simultaneous treatment of other associated factors like anaemia, sedatives for nervous subjects etc. According to him amphetamine sulfate, popularly known as benzedrine sulfate in 5 mg. doses half an hour before the principal meals act not only by reducing the generous appetite but also afford a sense of satiety[7] and well-being,[8] thus reducing the craving of the pleasure of a big meal. But benzedrine has in our experience got to be handled carefully, for excess may cause nervousness, insomnia habit formation etc.

CHAPTER LXIV

DIABETES MELLITUS

Diagnosis

Probable Causes in short. Though a disease of improper carbohydrate metabolism with glycosuria, hyperglycaemia yet there are numerous details and side issues in this metabolic disorder.

Mostly a disease of over weight individuals of sedentary habits, at the fourth and fifth decade of life, but juvenile diabetes in thin, underweight individuals of young age is not uncommon. Joslin in his large series showed 4.7 per cent of diabetes in persons during the first ten years of life.[1]

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6. Jour. Am. Med. Assoc. (1947 Feb. 8) 133 : p. 369,
7. Rosenthal and Solomon (1940 May) Endocrinology 26 : p. 807.
8. Myerson (1940 May) Am. Jour. Med. Sci. 199 : p. 729.
1. Mosenthal, (1927), Diabetes Mellitus. Practice of Medicine. Edited by Tice, Vol. IX p. 91 Hagerstown.

Indians specially Bengalis, Hindus, Jews and Maltese are the common subjects, but persons of no race or climate are exempt. There is a hereditary[2] tendency to perpetuate the disorder, though Joslin thinks that hereditary cases are always of a mild nature. Excesses in dietary, tending to accumulation of fat,, notably through carbohydrates and fats, by over increase of the body weight may contribute. How far an unbalanced diet, with an overwhelming proportion of carbohydrate in it, taken for a long time, may predispose to this disordered metabolism one cannot say definitely.

Any nervous strain or shock by lowering still further, the subnormal power of carbohydrate utilisation or by hyperglycaemia may make a latent condition manifest. Any shock by deranging or by over stimulation of the adrenals may turn a liminal case of diabetes into a manifest one. Overproduction theory[3] appears to be more now in vogue.

Septic foci are potent precipitating causes of this disease. Arteriosclerosis, though more commonly an effect than a cause, syphilis, gout, acute infectious diseases, repeated affections of the biliary passages,[4] disorders of the pancreas, and other glands of internal secretion, injury to the brain, loss of reserved alkali[5] ketosis etc., have been ascribed to be the causes of this, some times elusive, metabolic derangement.

Clinical feature in brief. When a patient comes complaining of some of the classical symptoms of diabetes such as polyuria, (frequent and much urination) polydipsia, (frequent and much increased thirst) polyphagia, (frequent urgency for food) undue weakness, loss of weight, dehydration, easy fatiguability, or for some of the well known complications, such as pruritus, carbuncle, neuralgia, etc., a careful examination of the urine may settle the diagnosis.

Urine. Amongst urinary findings the *raised specific gravity* of near about 1030 or higher, and a larger total quan-

2. Joslin and others, (1937). Am. Jour. of Med. Sci 193 : p. 8.
3. Soskin Levine, (1937). Amer. Jour. of Physiol, 120 : Dec. p. 761.
4. Lande and Pollack, (1936). Lancet, May 23rd p. 1161.
5. Ray and Mukherjee, (1935), Cal. Med. Jour. Dec.

tity than normal having an average of seventy-five to two hundred and fifty ounces or more in twenty-four hours may be of help.

Glycosuria. A sample from the twenty four hours' total quantity is of importance, as the first specimen passed early in the morning may not contain any glucose though the one passed after meals may contain it. For this test Benedict reduction[6] and sugar tolerance tests are also confirmatory points.

Renal glycosuria by lowering threshold limit from normal 0.18 per cent, shows sugar in the urine even with lesser blood sugar percentage.

Hyperglycaemia.[7,8] In order to exclude renal glycosuria and several other fallacies estimation of the fasting blood sugar shows a higher figure than 0.10 per cent, one should suspect, and generally even in mild cases of diabetes the blood sugar in fasting state has been near about 0.15 to 0.20 per cent or higher.

Asymptomatic diabetes. There are numerous cases of mild diabetes only detected by the routine examination at the time of life insurance or such other purposes. Transient glycosuria, after a big carbohydrate meal should serve as a warning to the patient and prompt him to seek treatment.

Complication. The person may seek medical help for one of the numerous complications.

Coma. Since the introduction of insulin though this has become much infrenquent yet it is not uncommon. In the urine one finds not only products of incomplete combustion of fat, such as, beta-oxybutyric acid, acetoacetic acid and acetone etc., due to the hotter flame of carbohydrate being depleted, but there may be also diminution of the alkali reserve of the blood, even a rise of the ammonia co-efficient in the urine from normal five per cent to ten to even eighteen per cent.[9] Fall of alveolar CO_2 tension from normal 4 to 6.2 per cent to one to two per cent[10] in acidosis or expressed in the other way from normal of thirty five to forty-five m.m. to twenty m.m. in acidosis are all helpful diagnostic points.

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6. Benedict, (1911), Jour. Amer. Med. Asso. 57: p. 1193.
7. Benedict, (1918), Jour. of Biol. Chemistry, 34:
8. Folin and Wu, (1919), Ibid. p. 81.
9. Beaumont and Dodds', (1936). Recent Advances in Med. 8th edition, p. 109-110.
10. Dodds, (1921), Jour Physiol. 54; p. 342.

1. *Coma is commonly seen in.* (1) Acute and undiagnosed cases of diabetes, (2) over eating with severe disease, (3) severe untreated cases, (4) diabetes with sepsis. Precipitating causes usually are. (i) Development of acute disease, either apparent, such as carbuncle, cellulitis or appendicitis, or hidden deep seated abscess or infection, (ii) omission of the usual dose of insulin, (iii) taking of large amount of carbohydrate, (iv) hyperthyroidism, (v) operation or surgical interference, (vi) nervous shock and such others. Blood alkalies are diminished.[11]

2. *Infections*, boils, carbuncles, pruritus, gangrene of the extremeties are seen due not only to sepsis but also from arteriosclerosis. Perforating ulcers, persisting eczema, and so on are not uncommon. In long standing cases tuberculosis of the lungs or the kidneys may close the scene. Due to lowered resistance, infectious diseases may assume serious magnitude.

3. *Heart and blood vessels.* Hypertension is sometimes met with in elderly diabetics, but whether it is the cause or the effect it is difficult to say. Sclerosis of the blood vessels of the brain, heart, kidneys, may result in their functional alterations. Pain due to coronary sclerosis or thrombosis, is not at all infrequet and the writer has seen three cases of coronary thrombosis recently in diabetics. But this has got to be differentiated from temporary glyosuria in coronary thrombosis in normal persons. Arteriosclerosis of the peripheral vessels may lead to *gangrene* commonly known as diabetic gangrene. The contributory causes probably are the superimposed easy infection, in a limb with poor blood supply due to the arteriosclerosis. Hyper-cholesterolaemia probably favours the latter change.

4. *Renal*—albuminuria is frequent.

5. *Oedema.* Local or general oedema is not uncommon and in the absence of renal or cardiac disease, may be traced to too much administration and retention of sodium ions in the system.

6. *Digestive.* Pyorrhoea is common and is more commonly a contributory factor of diabetes than the reverse. It demands proper care and this is often amply justified by

11. Lancet, (1930). i, p. 852.

the amelioration of glycosuria. Nausea, vomiting, diarrhoea, abdominal pain[12] may precede the onset of coma and should be borne in mind. Obstinate constipation may be a troublesome symptom.

7. *Nervous System.* Peripheral neuritis, preceded by neuralgia etc., are frequent, more commonly met with in arteriosclerotics[13] than hyper-glycaemics. Trophic disturbances, perforating ulcers are also met with. Loss of knee jerk, hyperaesthesia, numbness etc., are also seen. Cramps of a painful nature as a result of dehydration may be encountered.

9. *Special Senses.* Cataract and retinitis in the eye are common and should always be looked for in any long standing case. Optic atrophy, strabismus due to ocular muscle palsy may result.

10. Though not much affected at the beginning, yet in advanced cases the males become impotent and pregnancy in females makes the case worse. Not uncommonly ing case. Optic atrophy, strabismus due to ocular muscle palsy may result. Uterine inertia[14] and coma following child-birth are not rare.

TREATMENT

Prophylaxis. It is proved that diabetes is common amongst the overweight persons. Families with history of diabetes have got a tendency to over-grow and hence the importance of not only keeping their weight just a *little below the optimum by* curtailing fat, carbohydrate and sugar, but they should also be made to take *regular outdoor exercises.* The average weight of an individual can be calculated roughly like this, for five feet of height one grants 110 pounds and for each additional inch 5 pounds. But persons of diabetic families should preferably be kept below that weight. Besides restriction in diet and physical exercise, starvation once or more frequently every week or fifteen days may certainly help to ward off this metabolic disturbance. After the age of forty every corpulent or over weight individual should better starve once a week and take adequate physical exercise.

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12. Bread Wood, (1935), Jour. Amer. Med. Assoc. 105: p. 1168.
13. Jordan, (1936). Arch. of, Int. Med. 57: p. 307.
14. Krans, (1936), Med. Klin. 32: p. 375.

Hygienic Measures. Removal of all septic foci, either in the teeth, tonsils, intestine, skin or any where is certainly an important step in the treatment of diabetes. In a few mild cases under me, simple *restriction of the carbohydrates,* have diminished the amount of sugar passed in the urine. But the *bad pyorrhoea alveolaris when treated* and a few teeth with pus in their soakets removed, there was no sugar passed in the urine. The skin should be kept clean by daily bath, and colds avoided, as the resistance of the patient is lowered. Thin weak diabetic should better take tepid bath and use cold water only for the head. *Physical exercise of moderate* type are useful. Walking, golf, breathing exercises, massage, are quite suitable. Violent exercise *may precipitate coma.* Clothing should be reasonable. Worries, anxieties, nervous shocks, emotions[15] are damaging to the patient hence should always be avoided. *Constipation* is generally a very persisting symptom of all diabetics. This should be avoided at all cost. It appears that bad constipation is a contributory factor in the production of coma, and makes an ordinary case of diabetes worse. *The corns and trivial* injuries should not be carelessly handled. There are numerous instances, in which from cut corns fatal sepsis or cellulitis resulted.

Principle of curative treatment.

1. To try to manage the metabolism within the limits of the activity of islands of Langerhans left in that particular case may be enough. This is comparable to the management of cases of cardiac failure by asking them to live within the limits of the power of the myocardium. Normally the body metabolism is adjusted at a higher level than is essential for the maintenance of life. If the patient can utilise just enough limited carbohydrate diet to keep him going with capacity of his bare useful activity, then that is considered quite adequate treatment. Where this is not possible the aid of insulin may be required. 2. *Another group.* In whom their own insulin is not sufficient enough to make them live on a maintenance diet, not to speak of affording strength bare enough to enable to earn a living. In such cases insulin is the only agent which can serve the purpose. 3. To *get rid of the complications* insulin is the best treatment.

Plan of Treatment. Before actually starting treatment of a particular case one may advisably try to find out the nature, duration of the disease. *Glucose tolerance* test,

15. Wesselow and Griffiths, (1936). Lancet, i, p. 991.

may serve as a guide, wherever possible, to ascertain the nature of the case. Diabetes may be severe, moderate, or mild in type. To this conclusion, may also be arrived at by a dietary plan. If the patient passes sugar in the urine inspite of no carbohydrates being granted in the diet, he can be labelled as one of severe type. But when the patient is sugar free in the above diet and can utilise near about fifty grams of carbohydrate a day, he is of a moderate type of case. Mild cases can utilise much more and only slight restriction of carbohydrates in diet may be all that is required in managing them. This is only an arbitrary but useful classification, notably for handling cases.

A few facts. Another important point which one needs bear in mind, that it is in the hotter flame of carbohydrates that the fats burn completely and ketosis is prevented. So better utilisation of carbohydrates not only prevents ketosis and loss of alkali reserve, but also improves the general condition of the patient and ameliorates the troublesome bulimia, polyphagia, polydipsia, polyuria, loss of strength, reduces the risks of complications and so on. Lastly one needs remember that a severe diabetic by proper treatment may be turned into a mild one, whereas, an initially mild case, without treatment lapses into a severe state of disease.

DIETETIC

Restriction of carbohydrates in diet. There are several ways of approaching at this problem. Though *starvation* treatment originally advocated by Allen[16] (1913) and subsequently strongly recommended by Joslin is an important step, yet in our country, specially in private practice if the hungry diabetic is asked to starve at the beginning, quite a number of them would refuse our system of treatment. But if the patient is sensible to understand that starvation means, less depletion of the fuel of the system, with consequent less appetite and not uncommonly with a sense of well being, probably he will follow it. But personally one feels the better plan would be to cut down all carbohydrates and only allow such a diet which will appease his hunger.

Preliminaries. In every case the patient's co-operation is essential if any success in treatment is desired. He must adhere to the instructions to the very letter, otherwise the possibility of cure is remote. If the urine contains much

16. Allen, (1913). Studies concerning Glycosuria and diabetes, Harvard University press. Cambridge,

acetone bodies, and this likely in all advanced cases or severe type, one needs think of the advisability of giving glucose and insulin or the latter alone first and then go to dietetic restrictions. But in the vast majority of cases such a method is not at all required, and in them one may start with a diet containing only very small percentage or none at all of carbohydrates.

The following scale of diet generally supplies from eight hundred to thousand calories, and a large percentage of average diabetics improve under it. The basis of calculation of diet is given in subsequent pages.

USUAL DIET FOR AN AVERAGE DIABETIC.

Morning or Breakfast.

1. An orange or an apple, in their absence, two to four tomatoes with salt. 2. One cup of milk. 3. Tea one cup without sugar. Saccharin may be used to sweeten.

Lunch. 1. Soup of leafy vegetables (green spinash) one cup with plenty of lemon juice, salt and chilly or perper to taste. 2. Twice boiled green vegetables eight ounces or one poa. 3. Fish two ouncss or an egg or meat two ounces, in any form. *For vegetarians.* Channa, i.e., milk casein two ounces, or some preparation of lentils two ounces or one chittack. 4. To the boiled dal one may add some butter or clarified butter about two ounces or one chittack. *Tea (Afternoon).* As in breakfast. *Dinner.* Similar to that of lunch.

Plenty of water, and soups or decoctions of leafy green vegetables soured with lime juice appear useful. The green vegetables allowed generally are leafy vegetables of all types, including vegetables containing five per cent carbohydrate. The commoner ones in Bengal are :

Spinach of all types (shak) including Palong' (dantas of Lau, Kumra) plants of gourd, kolmi, halencha, palta, matar (pea), puin, chola (gram) etc., are suitable spinashes. Among vegetables potal, (palbhal) utchey (Karela), jhinga, papya "papita" (green) cauliflower, radish, brinjal, mocha (flower of banana), cabbage, cucumber, onions, tomatoes are allowable but in bad cases the major portion of the vegetable diet should be made up of leafy vegetables or spinash, twice boiled and most of the carbohydrates in them being thus eliminated, will though go to fill up his hungry stomach, but in fact he will be almost starving and that to his as well as to his doctor's advantage.

The above mentioned diet when allowed for a few days to one week, most of the patients' urine is likely be sugar free. But if being on such a diet for a week, a part of twenty four hours' sample urine examined daily, show sugar, one may curtail down the dal or lentils or meat or fish or egg or casein, and watch the effect. But in actual practice, one finds the above mentioned diet is generally effective to make the urine sugar free in majority of average diabetics.

The meals should be evenly distributed so that the carbohydrate in them is utilised properly and then according to the habit, taste and liking of that individual. Variety, is easily possible in such a dietary, if care is bestowed in their choice and preparation.

Green Vegetable Soup or broth. The green vegetable soup which is rich in minerals and alkalies not only flushes the system through the kidneys, but is a good source of alkalies specially when soured with lime juice, the latter being absorbed as alkalies, makes the risks of acidosis remote.

In mild cases, within three four days, the patient's thirst diminishes and he may not take much water, but this he must be warned against and specially instructed to drink fluids freely, so that the amount of urine passed in twentyfour hours remains near about fifty ounces or fifteen hundred c.cm. He should curtail and restrict all extra expenditure of energy, as he is on less than a maintenance diet. The findings of urinary sugar whenever doubtful, the result should be controlled by the estimation of blood sugar.

If not Sugar free. If only twice boiled vegetables properly cooked, milk and an apple are granted, but the fish, meat, egg, channa having been excluded from the dietary, fail to remove sugar completely from the urine, the patient should preferably be asked *to starve.* To this he may agree, specially when the failure of the above lines of treatment is explained to him. In case the patient does not want to starve, he may be allowed either one cup of milk every four hours or the cup of milk alternating with a cup of butter-milk (ghole) every four hourly consisting of a total of four cups. With the cup of butter-milk one should add some lemon juice, and salt to taste. The lemon juice alkalinises the system and prevents ketosis of starvation. This may help in rendering the urine acetone free. If the above lines of dietetic management, which granted the patient one pound each of butter-milk and milk, *does not free the urine of*

sugar, he should be given four ounces of thrice boiled leafy vegetables and half a seer or one pound of butter-milk a day soured with lemon juice. This is likely to render, the urine sugar free. But the urinary findings should be always controlled, wherever possible, by the estimation of blood sugar, before starting a serious addition and increase to the dietetic regime. If the patient after reasonable treatment of a few weeks, accompanied by occasional starvation in the lines chalked out above, shows reduced amount of sugar in the urine, and if the patient is agreeable, this line of treatment may be persisted on. Because lesser depletion of fuel from the body gives the pancreas a better chance to utilise sugar and actually the capacity to utilise carbohydrate increases and that in some cases considerably. An apparently refractory case kept on a very low diet, may respond well to this line of treatment when persisted for several weeks and the urine may thus be sugar free. *This point is not often realised and sometimes in haste an early aid of insulin is sought for these cases.* But before starting insulin treatment the dietetic regime should always be given a thorough trial. There are subjects, whose islands of Langerhans, inspite of rest given through proper dietetic regime, when cannot utilise enough sugar taken in the maintenance diet, require gradually increasing doses of insulin.

Starvation or a very low diet may increase acetone in the patient's urine. Not uncommonly this increase of acetone bodies in the urine of a diabetic on starvation, or on low diet may scare the doctor to take up either an insulin glucose regime or may prompt him to allow more liberal diet to the patient. This semi-starvation is generally justified, and if the low diet regime is persisted on, his power to burn sugar improves gradually and the increasing acetone bodies disappear by degrees, being completely oxidised in the hotter flame of the so long unutilised carbohydrates.

But when the patient shows *signs of toxaemia* such as coated, furred dry tongue, headache and a feeling of drowsiness, he should be treated by injection of adequate doses of insulin and glucose. But before this is followed the blood sugar should be estimated.

Scale of Diet. The scale of usual diet mentioned at *beginning contains about eight hundred to thousand calories.* But there is a relatively high proportion of fat[17] which

17. Banting, (1923), Brit. Med. Jour. ii, p. 446.

is not quite suitable for a diabetic, as fat is only ten per cent anti-ketogenic and ninety percent ketogenic.

When to add more diet. When this scale of diet is well tolerated and the urine of the patient free from sugar and the blood sugar within normal limits of 0.1 per cent or there about, the patient may be allowed either one cup of milk or four ounces or two chittaks of green leafy vegetables, whatever of the two he likes. The effects of this addition in dietary should be watched carefully for four days to a week, if the urine is sugar free one may allow both and watch the effects. Thus gradually one may add either one egg, or milk casein two ounces, or an orange or apple or fish or meat two ounces and the effects of this addition carefully watched by the re-regular examination of the urine. If this diet is successfully metabolised one adds two more ounces of five per cent vegetables to above mentioned dietary. In this way gradually, one can add measured quantity of diet of known composition.

Some suitable additions.

For Indians; Vegetables. Like cabbage, cauliflower, brinjals, patal (palbhal), jhinga, flowers of sweet gourd, spinash etc. may be fried with a covering of paste of powdered lentils (basham), or may be made into various sorts of curries, fry, chops etc. *The lentils or dal may* be taken in the form of bora, papadam, jhuribhaja, dhoka etc. Boiled and taken with butter, dal is liked by many and has good caloric value. Fruits allowed are oranges, apples, cucumbers, pamela (Batabi, shaddock), where available, green cocoanut water and its kernel. *Nuts.* Almond and pistachio (pesta), kernel of cocoanuts, and other nuts are allowed.

Chapatis made of kernel of cocoanut and bran two ounces may gradually be added to the diet.

Egg, Fish, Meat etc. Eggs, meat, fish in any form, in any preparation are allowable. Goat, lamb, rabbit, mutton, games, wild birds etc., may be taken according to the liking but always in measured and weighed amounts.

When to add Carbohydrates. When the above articles can be metabolised by the patient without glycosuria, one may add an ounce of either wholemeal flour (atta) or shuji to the diet in the form of chapati. Gradually two and then three or more ounces may be allowed according to the metabolic capacity of the individual. But the total amount should be distributed in three properly spaced meals, so that the utilisation may be easy. The custom of fasting on the

traditional days of full-moon and other days (Ekadoshi and Amaboshya) may be of service in these cases. Atta or sugar in the diet should be cautiously added in small amounts guided by regular urine and blood sugar estimation.

Urine Examination. Generally three hours after an offending meal, sugar is passed in the urine, hence the patient should be made used to test his own urine, specially after any new addition has been made to his dietary.

The average diabetic in India. The common prevailing form of diabetes in India is usually of a mild type. If in such cases treatment is instituted early they usually show improvement in their power of utilising carbohydrates, notably when on a low diet. But in actual practice it has been found that if the patient on the addition of a new article to his diet, begins to pass sugar in his urine, generally he has got to start from the beginning that is, from a non-carbohydrate one. This fact should lead to very cautious additions being made to the original low dietary.

Under-nutrition. In over-weight persons, just passing traces of sugar the scale of diet fixed up at the beginning of treatment will render his urine sugar free in a few weeks or months. But here comes the important *question of under nutrition*[18] if the patient is made to live on such a diet for prolonged periods, not only his efficiency suffers, but he may even fail to carry on his duties satisfactorily, so for this purpose one must known the basal requirements of his patient Mosenthal (1935) is very particular on upkeep of nutrition of the diabetics.

Basal requirement. It varies according to the weight and age of the patient. For an adult about twelve to fifteen calories per pound of body weight are required.

Generally women require ten per cent less and children proportionately more. These figures are the minimum, and only slight muscular activity is possible. For the maintenance of weight and for some muscular exercise to be made possible, an addition of from ten to twenty per cent has got to be made to the above values.

Proportions of Carbohydrate, Protein and Fat.

Though somewhat arbitrarily fixed, yet the mild cases of diabetes will not tolerate more than forty to sixty grams of carbohydrate a day. The proportion of proteins should be calculated as half or three-fourth of a gram per pound of

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18. Jour. Amer. Med. Assoc. (1935), 105: p. 484.

body weight per day. The remaining of the calories to be built up by the fats. But Woodyatt[19] (1921) Banting (1923) are of opinion that the ratio of fat to carbohydrate should be 1 to 1.3. Excess of fat in the diet not only is a dangerous source of ketosis, but also appears to lead to hyperglycaemia. So in the dietary there should not only be restriction in quantity, but they should have a definite ratio. *Modern tendency is to give proportionately more liberal carbohydrate.*

Calculation. There are so many ways of calculation of the diet in diabetes that one is at a fix to realise which to follow. But the calculation given above indicating on an average fifteen calories per pound of body weight with other modifications given there-under according to age sex etc., appear suitable for the average patient.

In the calculation of dietary the ideal weight of the individual should be taken into account and that is based roughly on the assumption of one hundred and ten pounds for every five feet and for every additional inch five pounds. For women five pounds subtracted from the total. The calculation on the basis of ideal weight has the advantage that the thin subjects get comparatively more and the stout ones less in calories, thus tending to increase the weight of the former and to decrease that of the latter. It is also useful in cases of oedema.

But recently Robinowitch (1930-31) has introduced a modified plan of efficient treatment, his calculations are a bit on the lower side from the calculations given above.

Insulin. It was discovered by Banting and Best in 1922. As an agent of therapeutic efficacy it is unique. It has shorn diabetes and its complications of their horror. It acts :— (1) By burning glucose, the maximum effect being reached in about three to four hours. One unit of insulin helps the utilisation of about 1.5 to 2 grams of glucose. (2) Promotes the formation of glycogen in the liver and the muscles. (3) Inhibits formation of sugar from the proteins. How it brings about these changes has been differently interpreted by different workers.

Indications of Insulin therapy.[20] 1. Those who *cannot metabolise enough calories on the restricted dietetic regime outlined above*, to give just enough energy to carry on their bare duties, require insulin to supplement their own. These

19. Arch. Int. Med., (1921), 28 : p. 125.
20. Falta (1928) Wein. Klin. Woch. 41 : p. 1411.

are generally rather severe cases of diabetes. 2. In complications of diabetes such as coma, gangrene, septic processes, tuberculosis of the lung and such other. 3. Where surgical intervention is required on a diabetic. 4. In mild cases, normally manageable on a restricted diet, the supervension of any intercurrent disease, often makes sugar appear in the urine. Here insulin treatment may be of use. In these cases dietetic indiscretions may be indulged with supplementary injections of insulin. 5. Though not necessarily always for diabetic cases, yet for very thin emaciated diabetics or in other thin persons insulin by augmenting metabolism, and food intake often increases weight. It may be valuable in anorexia nervosa, tuberculosis in thin subjects etc.

The use of insulin without blood sugar estimation.[21] After a preliminary estimation of blood sugar to ascertain that there is true hyperglycaemia, one starts on the following lines.

At first what only dietetic regime can achieve is determined. If he requires insulin, as shown by glycosuria even on a restricted sub-optimal diet, the patient is given injection of five units of insulin half an hour before breakfast, and the sample of urine passed three hours after this meal is examined and every sample of urine passed three hours after each meal is examined separately. If all the samples passed three hours after the breakfast preceded by insulin injection, contain sugar, one may increase the dose to ten units before breakfast, and the samples or urine passed three hours after each meal of the day examined. If the sample after breakfast is sugar free it is better to continue the same dosage. Even if not completely sugar free the same dosage of insulin is injected, as this may increase the carbohydrate tolerance of the individual and the smaller amount of sugar passed may also disappear in a few days. If the sample of urine passed, three hours after a dinner shows a high percentage of sugar persistenly, one is justified in giving five more units of insulin half an hour before this meal. When insulin is being injected the patient should preferably take his dinner at about six in the evening, to avoid any risk of hypoglycaemia that might follow, specially when bigger doses of insulin are used.

In this manner one works up the dosage of insulin, rendering the urine sugar free but also just short of any hypoglycaemic shock. Once a stability is reached it is advis-

21. Recent advances in Medicine, p. 131.

able to control the treatment by occasional blood sugar determination. It is also imperative to remember that with the improvement of general health the tolerance for carbohydrates may materially improve and the same dose of insulin may percipitate mild or even severe hypoglycaemic shock, indicating lessening of dosage.

Although by this method it is possible to keep the urine sugar free, yet it may not be possible to ascertain if the pencreas is getting maximum rest. For this purpose determination of blood sugar is essential.

High Carbohydrate, Low Caloric diet. Rabinowitch[22] (1930) was mainly responsible for the successful introduction of a diebetic diet containing a greater proportion of carbohydrates. It is well known that ketosis results from incomplete combustion of fats. Hence the stress was laid on giving not more than fifty grams of fat in the day's dietary, the rest of the caloric value was partly made up by carbohydrates. The advantage was better toleration of the latter ultimately, and much less incidence of complication like tuberculosis, gangrene and cardiovascular disease. Geyelin[23] (1935) after ten years experience in the treatment of diabetes on a high carbohydrate diet not only corroborated the above, but also found such a diet was of value in avoiding hyperchlolesterolaemia and hyperinsulinism. Cruishank[24] (1935) also supports the idea based on his practical experience. Watson and Wharton[25] (1935) compared the effects of various diets and were in favour of a high carbohydrate one, and showed that if more than one hundred and twenty-five grams of fat were allowed in daily diet the tolerance for carbohydrates fell. They however were not convinced of the cholesterol increasing effect of a big fat diet.

Though Rabinowitch advocated a high carbohydrate diet, yet he always insisted on a total low caloric intake, kept his patients permanently, but slightly under-weight so that the person was about five pounds below his ideal weight. Gray and Sansum[26] (1933) discussed this point in

22. Canad. Med. Assoc. Jour. (1930), 23 : p. 489. Ibid, (1932), 26 : p. 141.
23. Jour. Amer. Med. Assoc., (1935) 105 : April 6. p. 1263.
24. Glasgow. Med. Jour. (1935), 123 : May, p. 293.
25. Quart. Jour. Med., (1935), July p. 277.
26. Jour. Amer. Med. Assoc., (1933) May 20 : p. 1580.

some detail and they think that with high carbohydrate diet physical vigor and mental alertness and social usefulness are greater as compared with the old diabetic regime.

Achlorhydria. Usually there is either achlorhydria in diabetes or deficiency in its secretion. Personally, recently I have treated all my cases of diabetes with dilute hydrochloric acid and glycerinum pepsin in half and one dram doses of each respectively an hour before the two principal meals apparently with better results.

Substitutes of Insulin. Synthelin a guanidine preparation was first introduced. Its hypoglycaemic effect is slower but longer lasting than that of insulin. How it acts is not quite clear. It is toxic to the intestinal tract and the liver.

"*Glycocinin.*" The broth of green vegetables and the juice of fresh green leaves of "telakucha," the leaves of cabbages etc., may be effective in reducing blood sugar probably due to their glycocinin like substances. Black berries or 'kalojam' of our country are reputed to have anti-diabetic properties. But they require further investigation before could be seriously accepted.

Pancreatic or other digestive substances. Trypsogen, Pancreapetene (A. F. Drug) are supposed to be useful by giving rest to the external secretion of the pancreas. It is suggested that when the gland's external secretory activity is given rest the internal secretion increases. These preparations are useful in this way and may be tried in mild cases. But it must be clearly understood that there is hardly any efficient substitute for insulin.

Phosphotungstate of insulin Mukherjee, (1930.[27]

A phosphotungstate of insulin, given orally in very big doses, brings the blood sugar down. But is very expensive in comparison with the effect derived.

Intravenous Glucose Treatment. Daily injections of fifty to hundred and fifty c.cm. of twenty-five per cent glucose solution per vein for weeks without insulin have been advocated. The diet is restricted as in all cases. This is in keeping with the high carbohydrate diet in the treatment of this disease.

Nervous Strain. The patients nervous system should be kept unexcited and soothed. He should take adequate rest mental as well as physical.

27. Brit. Med. Jour. (1930 Dec. 13) p. 1002-1003.

Climate. Cooler climate, by increasing the metabolism is often helpful to the diabetic. It is also a fact that he becomes worse in the summer months, hence the usefulness of a cold climate.

But it must be expressed unequivocally that there is no unanimity about the use and indications of insulin in diabetes. Many authorities hold varying opinions. Only the important and common indications are given above.

The doctor and the patient alike should always remember that insulin *is a supplementary substitution therapy* and more reliance should be *placed on economising the metabolism based on dietetic restrictions.* The patient, except on very special occasions, should not be allowed to overstep the limited dietetic regime. More liberal diet means greater metabolism and greater leaking out of the fuel which if retained would have completely oxidised the fats with lesser chance of ketosis, and its accompanying evils. The hyperglycaemia causes more thirst to dilute the blood sugar causing polyuria and consequent dehydration, the loss of fuel causes greater appetite, which greater but unutilised food intake only tends to make worse. Here comes the supreme importance of economy in metabolism.

Method and time of administration of Insulin. Unless the condition is very urgent indicating intravenous insulin therapy, it is given practically always subcutaneously. As the maximum effect is reached in three to four hours after it is injected about quarter of an hour before a meal. It is also worth noting that following a particular meal the blood sugar level in the diabetic reaches its height near about the beginning of the third hour or at the end of the second hour, hence the coincidence of the maximum action of insulin at the height of the sugar curve. But unless the metabolic activity synchronises with the diet and the amount of insulin, and unless the evening dose is given at least four to six hours before going to bed, there may be a risk of hypoglycaemia during sleep. This is also likely when large doses are injected in the evening, hence one should be careful about the evening dose of insulin.

Dosage. There cannot be any fixed rule as to the dosage. Every case of diabetes should be individualised and insulin requirement fixed up according to his particular state of sugar tolerance and metabolic activity and so on. In cases whose own insulin producing capacity is slightly affected will naturally require very little supplementary exo-

genous insulin as compared with a severely affected person with very little of his own insular element left, thus requiring the help of heavy doses of exogenous remedy.

Roughly the following points may be helpful.—

(1) Duration, severity of the case, with subjective and objective findings. (2) Fasting blood sugar level. (3) The amount and persistence of sugar and ketone bodies in the urine of the patient. (4) Response to glucose tolerance test and to restricted dietetic regime.

Many factors will modify and necessitate variation of the dosage of insulin even in the same patient. The same person with a constant dose though passes a sugar free urine normally, may pass sugar when gets an attack of slight cold in the head. A diabetic with septic complication requiring big doses of insulin, may suddenly show hypoglycamic shock even to smaller ones, when the wound is nearly or completely healed up. *The calculation is based on estimating the total amount of sugar excreted in twenty-four hours and number of units of insulin* required will be more or less half the grams of total sugar passed. Suppose a person on restricted diet passes a total of about twenty grams of sugar in twenty-four hours' urine he will require roughly about ten units of insulin per day.

In moderately severe cases. After a thorough trial of dietetic regime, an estimation of the blood sugar, and calculation of the total amount of sugar passed in twenty four hours, the insulin requirement is easily determined and preferably given by two subcutaneous injections of equal halves fifteen minutes before each of the two principal meals, containing most of the carbohydrate that the patient takes.

As has already been discussed a few days treatment by insulin generally permits more of diet to be added without an increase of the dosage of insulin. But if this additional diet shows sugar in the urine, passed three to four hours after the meal preceded by the injection of insulin, the natural conclusion is that the dosage is not sufficient enough to make the patient utilise his whole amount of carbohydrates in the meal, hence insulin should be increased and five units more added to each morning and evening injections. Generally in these cases about ten to twenty units every twelve hours making a total of twenty to forty units per day may render the urine sugar free. This gradually increasing tolerance for carbohydrates while on insulin, is all the more true in cases where the proportion

of fat in diet is reduced. A high proportion of carbohydrate in diet helps in the easier reduction of blood and urine sugar than does a meal with greater ratio of fat.

Stabilisation of insulin and diet.

Gradually when the patient's tolerance for sugar increases, the dosage of insulin may slowly be reduced till a stage of balance is reached when by the adjustment of diet and the dosage of insulin the patient's blood sugar remains more or less normal. After a few weeks of this regime, one tries to reduce still the dosage of insulin and see the result as shown in the urine passed two to three hours after that meal preceded by the lesser dose of insulin. If no sugar is passed, after two days or so, the blood sugar is estimated. If it is normal, one may try the effects of still smaller doses to ascertain whether the patient can do without insulin and live well on a somewhat restricted diet.

Severe cases. But unfortunately there will be subjects who cannot revert back to utilise such an amount of carbohydrate, without insulin, as to give them an optimum health with limited but unavoidable working capacity. Such persons will probably require insulin though generally in much smaller doses, than their initial requirement, for the rest of their lives. Such persons should be taught to take their own injections of insulin before the meals as indicated above.

Some rules for severe diabetics, requiring insulin, to follow.

(1) These persons should be within the reach of the doctor. (2) They should follow the written instructions of the physicians in all matters of life. (3) They need take adequate care of their health in general. (4) Any intercurrent disease or any complication should prompt the patient to consult the doctor, as it will generally cause a variation in the dosage of insulin. (5) The patient should know of the early signs and symptoms of hypoglycaemic shock and its remedy. (6) Any variation of diet or the dosage of insulin may prove dangerous unless the doctor is consulted. (7) In very severe cases of diabetes requiring big doses of insulin, may receive it in three or four equally spaced injections, instead of twice daily. This point will be discussed later under the treatment of complications and under the head of zinc protaminate of insulin. (8) Violent exercise should always be avoided by the patient receiving insulin, at it may precipitate coma.

Protamine insulinate. Hagedorn and his colleagues at Copenhagen in their search for a more slowly acting and insoluble insulin, discovered protamine insulinate. It is a combination of protamin of fish roe and insulin. Recently protamine zinc insulin a still more stable preparation than the above one, has been introduced. This when injected subcutaneously, starts acting about 12 hours after injection keeps the blood sugar low till about twenty-four hours or longer. Due to its slow and continued action for about 12 to 15 hours it is likely to find favour with those diabetics who receive their own injections, as the effect of one injection may last the whole day. The American workers are in favour of giving this insulin two hours before breakfast and ordinary simple insulin only where required before dinner. Just the reverse is the method followed by the Danish school.[28] All the authorities on diabetes look upon this discovery as a step forward in the treatment of diabetes. Joslin[29] and others think it very useful in cases of high fasting blood sugar, in insulin sensitiveness or hepatomegaly or lipodystrophy. But where rapid action is required, as in the treatment of diabetic coma this insulin protamine is unsuitable due to its slow action. Hence ordinary insulin is always to be given in diabetic coma.

Now we have got 3 types of insulin (1) The ordinary quickly acting one when injected the action starts almost in an hours time and lasts for about five more hours. (2) Then the globin insulin with zinc which starts effect from the 6th hour after injection and the action lasts for 12 hours more, to some extent for 15 hours after taking effect, the intermediately acting one and the last, (3) the zinc protaminate of insulin which usually starts to lower blood sugar about 12 hours after the injection and the effect lasts for about another 12 to 15 hours, hence protaminate sometimes causes hypoglycaemic syndrome in the patient in the early hours of the next morning.

I have used soluble with globin in equal units by one injection before lunch at the sametime in one syringe in a few cases with good results. Such one injection being adequate in keeping the urine sugar free for the day. Zinc

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28. Medical Annual, (1937), Diabetes, p. 118.
29. New Eng. Med. (1936), 214 : p. 1079.

protaminate appears too slow acting with risk of early morning hypoglycaemia.

TREATMENT OF DIABETIC COMA

One, while discussing the complications of diabetes already, stated about the causes precipitating coma.

How to prevent the onset of Coma.[30] A patient of diabetes when develops an acute infection, though passing a sugar free urine normally on comparatively smaller doses of insulin, may pass into the stage of coma in twenty-four hours. The acute febrile condition, may give him a bad taste in the mouth with loss of appetite, and as he does not feel inclined to take his meal, he generally omits the usual morning dose of insulin, which paves the way to the precipitation of coma. In such cases the patient though passes a sugar free urine yet there may be acetone bodies, under such circumstance one-third the usual dose of insulin should be given. While the urine contains only traces, half, and if much sugar, full dose of insulin needs be given. In cases where the patient takes carbohydrate in a meal, insulin should be increased by another five units per dose. But the next dosage should depend on the estimation of blood sugar in six hours time. Sometimes where the threshold limit of the kidneys is very high, the examination only of the urine for sugar may be deceptive and test for ketone bodies is indispensable. It is only by timely administration of insulin, that coma may be prevented.

After development of coma. In a hypertensive subject of diabetes, coma should be differentiated from other causes of unconsciousness, such as apoplexy, uraemia, etc. Here the previous history and determination of blood sugar, alveolar carbon dioxide tension, and ketone bodies in the urine, results of treatment are some of the helpful points to come to an idea as to the prognosis.

Insulin. Before taking the patient to the hospital, if the case is already in deep coma, one may safely inject subcutaneously about fifty to eighty units of insulin generally calculated at two units per kilogram of body weight. But if one can find out his usual daily insulin requirement, double of this may be given. Where no hospital facilities are avail-

30. Grahm, (1936), Modernment in general practice Diabetic coma Vol. I. p. 1. Medical Press and circular publication.

able, next step should preferably be guided by the blood sugar estimation, it is though invariably very high. Dillon and Dyer[31] (1935) report sixteen hundred cases of diabetic coma with blood sugar of thousand mg. or more. The rest of dosage will depend on the presence of acetone bodies, or sugar in the catheter specimen of urine drawn out every three hours. One-fourth the dose of insulin given initially as indicated above may have to be given every four to six hourly until the patient improves.

If he is not in deep coma, about thirty to forty units of insulin may be injected and the rest of the dosage adjusted according to the above mentioned findings.

Glucose. Simultaneously after the injection of insulin, glucose should either be given orally if the patient can take, though this is not practically possible in most of the cases. Two ounces of glucose (about 50 g.) dissolved in ten ounces of a one per cent saline may be given flavoured with the juice of a lemon where the patient can swallow. Otherwise twenty ounces of saline containing about two ounces of glucose may be given either *by a nasal catheter* or *a* stomach tube, preferably by the latter route, after pumping out the stomach contents. Where the cardiac condition permits and the coma deep glucose could be given intravenously. Four to six hours later again, glucose may have to be given, after examination of the catheter specimen of the urine, along with the second dose of insulin, and subsequently also in the like manner. *Insulin burns the glucose and creates a hot flame* for complete combustion of the ketone bodies, the cause of the coma.

Fluids. Laurence[32] (1936) has emphasized the great importance of combating dehydration in the treatment of diabetic coma. Frequently water should be administered in the form of hypertonic saline upto three to six pints, sometimes intravenously, covering one to two hours, until the tension of the eye ball is normal and systolic blood pressure is over hundred m.m. of mercury. In less serious cases oral or rectal methods should be employed to combat the dehydration.

Salts. Sodium chloride is depleted from the system and should always be given in one per cent or 0.9 per cent

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31. Amer. Jour. Med. Sci. (1935), p. 683.
32. Brit. Med. Jour. (1936), ii. p. 81.

solution per vein, orally, rectally etc. It is an important item in the treatment. Potassium ions are useful for air hunger.B

Alkalies. Sodium bicarbonate though not absolutely essential in average cases of coma in diabetes, yet in bad cases with deep coma one may have to give about five to seven and a half percent solution of sodium bicarbonate per vein upto a few hundred c.cm. Generally twelve grams of sodium bicarbonate are adequate. But in worse cases more may have to be given. Sodium bicarbonate may cause oedema hence is objected to by many workers. Orally potassium citrate may also be given.B Sodium bicarbonate solution should never be given subcutaneously or intramuscularly as it may cause extensive sloughing when so given.

Sodium Lactate. Hartman (1935) strongly advocates sodium lactate solution to be injected in very big doses.

Treatment of shock. The patient should be kept warm by blankets, hot-water bottles, hot air bath etc. Electric devices where available are of service for these purposes.

Constipation. Bowel washes, castor oil, saline purges, should always be given as the patients are very much constipated and often this precipitates the attack of coma.

Cardiac Weakness. When the heart is weak too much of intravenous saline or glucose, or sodii bicarbonate solutions, may render weaker and precipitate its failure. Hence large quantities of fluid should not be given intravenously on a weak heart.

Fruit juices. Citrous fruit juices orally are of use. No solid food should be given for at least forty-eight hours or more. Glucose, saline, alkalies, fruit juice, specially acid fruit juice, such as lime juice in glucose water, sugar candy water, may have to be given for a few days before starting to give solids.

Stomach and intestinal lavage. Lavage of the stomach and bowels is of importance, because, the absorption of the intestinal contents makes the condition worse. Sometimes undigested food material may remain in the stomach for a long time, which has got to be pumped out specially because these materials when brought out by vomiting there is a risk of aspiration into the respiratory passages resulting in aspiration pneumonia.[33]

33. John, (1935), Jour. Amer. Med. Assoc., (1935), 105: August 24. p. 587.

B. Holler (1946, Aug. 10) Jour. Am. Med. Assoc. 131: p. 1186.

Recently Almyetal (1945)A have developed a simpler method of treatment of coma more suitable for hospital practice because they used (1) *units of ordinary insulin subcutaneously every half hourly* till the patient was free from all signs of ketosis, clinically and by laboratory data. (2) *Fluid intake* 1000 to 1500 c.c. or more in the form of saline glucose orally or grape or orange juice 3-5 hundred c.c. (3) *Glucose saline intravenously* when the patient was drowsy. Rate of injection should be slow in patients above forty years or with arteriosclerotic vassels. (4) *Test urine for ketonuria and glycosuria half hourly or hourly.* (5) When free from ketonuria etc. 25 units of insulin every 2 hourly for at least 8 more hours should be given. (6) If the patient is anuric think of acidaemia and regular estimation of the alvedar CO^2 tension may be a guide and alkalies given according to indication.

But the broad principles of treatment of diabetes when followed give good results.

Vitamins and Diabetes. Vitamins A, B and C appear of definite use, specially the latter. According to Pfleger and Scholl (1937) in all diabetic patients, irrespective of the modification of the sugar metabolism, cevitamic acid or ascrobic acid or c vitamin concentrate, improves the general condition. The fatigue disappears, the patient feels fresher, and the vitality is increased. Hence the importance of adequacy of C vitamin in the diet is emphasized.

HYPOGLYCAEMIA.

There may be the danger of a patient of diabetic coma while under treatment to pass into the stage of hypoglycaemic shock and consequent unconsciousness. Their differential diagnosis is discussed below.[34]

	Diabetic Coma	Hypoglycæmic Coma
Onset	Gradual.	Very sudden.
Skin	Usually flushed or cyanotic. Dry.	Usually very white, but may be normal, sweating common.

A. Jour. Am. Med. Assoc. (1945 Nov. 24) 129: p. 863.
34. Wien. Arch. f. inner. Med., (Vienna), (1937). Oct. 31 : p. 219.

	Diabetic Coma	Hypoglycæmic Coma
Tongue	Dry.	Moist.
Breath	Smells of acetone.	No smell of acetone.
Respiration.	Deep specially the abdominal movement.	Shallow.
Pulse	Rapid, feeble.	Normal and bounding.
Eyeball tension	Low.	Normal and raised.
Urine	Contains sugar and diacetic acid.	Does not contain sugar or diacetic acid (unless the bladder has not been emptied for some hours).
Blood Sugar	Over 200 mg. per cent sometimes much higher.	Below 70 mg. per-cent may be as low as 40 mg.
Blood pressure	Low.	Normal.

Hypoglycaemic shock should be treated by injection of half a c.cm. of adrenalin intramuscularly and adequate amount of glucose per vein.

Signs of improvement in cases of Coma

(1) Gradual recovery of consciousness. (2) Decrease in depth of respiration, the abdominal breathing becomes less marked. (3) Increase in the tension of the eye-ball. (4) Improvement of the volume and pressure of the pulse.

Sepsis and Secondary infections or acute infections.[35] They should be taken seriously and adequate treatment instituted without delay, because such diseases always upset the systemic capacity of utilisation of carbohydrates, may precipitate coma and may even cause rapid downward progress not only of diabetes but also of the super-imposed infection. In such cases the dose of insulin has got to be increased, as the usual dose with the restricted diet which kept the urine sugar free, cannot keep it such, and sugar appears in the urine, during the supervention of an intercurrent acute infection or septic process. Insulin in these cases should preferably be divided into three or four daily portions of sufficient dosage, say from twenty or forty units each with or without glucose, so that the urine is kept free

35. Baker, (1936), Arch of Internal. Med. 58: p. 347.

from sugar and the blood sugar comparatively low for the whole twenty-four hours. In cases of pneumonia or such other acute infection, glucose and insulin need be pushed almost in the same way as in cases of coma.

Pulmonary Tuberculosis in the Diabetic.

That diabetics of long standing are liable to tuberculosis should always be kept in mind. According to Dunlop[36] (1937) such cases not only require more units of insulin to control the glycosuria, but there is loss of weight and may fail to show fair health, this is more likely in cases of coma particularly in children. They should be regularly examined to exclude this infection and should be kept away from open cases of lung tuberculosis. Proper treatment and early diagnosis make the outlook brighter. Sanatorium life, artificial collapse of lung, high fat and caloric diet with insulin are useful. Both being wasting diseases diabetics with tuberculosis often fare badly. Persons with lung condition due only to tuberculous infection without any secondary pyogenic invasion being superimposed, generally respond to insulin, but once these pyogens make their appearance, these cases are rather difficult to manage, and may require incredibly big doses of insulin to keep the urine sugar free. Big doses of insulin should be given to help these patients to metabolise carbohydrates, fats and other concentrated fatty and vitamious diets. The diet and insulin both should be liberal and they should be so adjusted that the patient gains in weight specially when there is emaciation, which commonly is the case in such circumstances. When surgical interference such as artificial pneumothorax etc., are required the diet and insulin may require readjustment. Injections of penicillin and streptomycin according to indication may help much in these cases with insulin.

Coronary thrombosis not uncommonly this is the cause of death[37] or may damage the heart badly. They also require special treatment. Insulin should be cautiously given, as it increases the load on the heart to about twenty-five per cent, and a little extra glucose in the blood is often salutary.

Juvenile Diabetes.—

Treatment of juvenile diabetes generally affords somewhat disappointing results. Comparatively big doses of

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36. Dunlop, (1937), Edin. Med. Jour. 44: May, p. 351.
37. Leary, (1935), Jour. Amer. Med. Assoc. August 17, p. 480.

insulin have got to be given because of the greater requirement of the body for the purposes of growth and development.

Here unlike the corpulent elderly diabetics, who on a restricted carbohydrate diet progress favourably, these cases of infantile or juvenile type of diabetes, whose insular apparatus is more or loss irrecoverably damaged or affected, generally require big doses of insulin, more or less for the rest of their lives. Protamine insulin[38] and its zinc salt are improvements particularly useful for these cases.

DISEASES CAUSED BY THE COMMONER ANIMAL PARASITES

CHAPTER LXV

CERTAIN GENERAL POINTS IN THE STUDY OF INTESTINAL WORMS

Frequency. The smaller the parasites the greater are their number.

Contributory factors to these worm infections are:—

(1) Careless personal habits; more common in children. (2) Drinking of unfiltered water; dirt, dust and faecal contamination of food and drink. Ova in big dirty nails, may cause reinfection. (3) Pork or other meat when taken raw. (4) Hydatid, in dog breeders, more common in Australians. (5) Want of proper disposal of stools, sewage and careless habits of promiscuous defaecation. (6) Due, to favourable temperature and environment they are more frequent and numerous in the tropics.

Age and Sex. Children and younger persons are more commonly affected than adults with clean habits.

Effects on the host:—

(1) Nourishment which should go to the host is usurped by the parasites. (2) Some of the parasites suck the blood of the host. (3) Irritate, cause pressure e.g., ankylostoma, ascaris, even destory organs and tissues. (4) Natural channels may be obstructed, as ascaris chokes the *trachea* of the infants. Wandering of some of these parasites may cause irritation, and injury to the intestinal

38. Feinblatt (1937) Med. Record. 145: p. 366.

mucosa, skin etc. (6) Some toxic substances are either elaborated which change the natural condition of the body fluids. Some of these toxins have inbibiting action on the bonemarrows etc., leading to marked anaemia and eosinophilia, a phenomena common almost to all worm infection. (7) Some of the liver flukes may cause cancer; appendicitis and peritonitis caused by the round worms are not uncommon.

DIAGNOSIS.

This depends on indirect methods like cutaneous sensitiveness to the respective proteins derived from the parasites or sero-diagnosis or eosinophilia. But by far the most important diagnostic method is to scrutinise the stools under the microscope for the ova of the respective parasites, by giving a saline purge the previous evening. There are numerous methods of concentration of these ova which may be of considerable help in cases where ordinary examination of the stool gives a negative result.

There are other methods such as by culture, separation[1] and centrifugation[2] etc. of concentrating the ova in the stool, which may have to be taken resort to, in special cases.

COMMONER NEMATODES OR ROUND WORMS

General.

The word nematode, derived from Greek derivative, means resembling thread. The most common[3] of the intestinal round worms are ankylostoma duodenale, ascaris lumbricoides and oxyuris or enterobius vermicularis, besides a few others of minor importance.

ANKYLOSTOMIASIS OR UNCINARIASIS

(Or Hookworm Disease)

There are two common types known as ankylostoma duodenale and necator americanus. They enter through feet of bare footed pedestrians and hands of gardeners cause-

1. Maplestone, (1934), Ind. Jour. Med. Research. 22: Oct. p. 203.
2. Yacob and Chaudri, (1934), Ind. Med. Gaz. 64: Sept. p. 500.
3. Allen, (1935), Practitioner. 134: p. 502.

ing a ground itch. The young parasite moults several times, notably in hot rainy months before it is ready to infect the person. From the leg it reaches, through the venous or lymphatic circulation, right side of heart, whence it is held back in the lungs, thence coughed up through the trachea, swallowed down the oesophagus, reaching stomach, jejunum and ileum. Mostly they live in the middle and distal part of the small intestine. There may be other modes of infection too. Symptoms caused by, sucking of blood, catarrh and inflammation of the lower part of the small intestine are common, preventing proper absorption of fission products of protein food etc. A, toxin is produced which is inhibitory to erythropoiesis, causing anaemia and eosinophilia, and also delay in the coagulation of blood.[4] Bleeding or oozing out of blood from sore areas, singly or in combination contribute to anaemia.[5]

Symptoms are lethargy, loss of memory, unwillingness and inability to work, a fact worth remembering for doctors handling labour force; headache, dizziness, mental defect, anaemia, waxy appearance, atrophy of the skin with a peculiar velvety feel below and about the umbilicus, improper or poor development and growth, scanty or no development of hair in the armpit etc., flabby blotting paper like tongue, pain and tenderness round and to the right of umbilicus, are said to be very characteristic symptoms. Diarrhoea and dysentery, pain in the abdomen, capricious or ravenous, or perverted appetite, the patient liking to eat earth, chalk, mud, charcoal etc. are common. Flatulence dyspepsia are frequent. Due to intense anaemia of a secondary type, there may be palpitation, dyspnoea, breathlessness on exertion, oedema, anasarca etc. Haemic murmurs are quite common, mostly in the pulmonary area.

Diagnosis—clinically. "Anaemia with under-development, weakness and a dilated heart and a history of ground itch are not likely to be confused with anything else" says Stiles. The above groups of signs and symptoms are highly suggestive clinically. But the important and sure diagnostic point is by finding the typical ova in the stools.

4. Chandler, (1935), Amer. Jour. of Trop. Med. 15: May, p. 357.
5. Foster and Gross, (1934), Ibid. 14: Nov. p. 565.

TREATMENT

This has got to be considered from the stand point of the masses and private individuals.

Treatment of individuals.

Carbon tetrachloride. The dose is three c.cm., the maximum for an adult, to be followed in one to two hours' time by half to one ounce of saturated solution of magnesium sulphate, according to the age, weight etc. of the patient. The drug is usually given in the morning, the previous night the patient having taken a light carbohydrate diet.

For children the dose should be two minims per year of age.

As the remedy is a liver poison, so it is better that one gives a prescription like the following to be taken thrice the day before, on the day and on that following administration of this drug.

Cal. gluconate or lactate	gr. 10
Soda Bicarb	gr. 15
Glucose (powder)	upto dram one

One powder thrice daily for three days as above, help to protect the liver from injury. Milk casien and milk preparations and vitamin B complex are known protectors of liver from damage, so also is methionine.

If the patient cannot afford to take the above powder which protects the liver from getting damaged, one may ask him to take a glass of milk with plenty of sugar in it, twice a day, for three days. Poisoning symptoms are eructations which may give out smell like that of boiled cabbage, and cause headache, nausea, dizziness, etc. This may be followed by jaundice and symptoms of acute yellow atrophy liver in very grave state of poisoning. Remedy of this condition lies in giving orally very big doses of glucose, calcium, alkalies, as discussed under the treatment of jaundice. One g doses of methionine 4 times daily has protected the liver from damage.

Contraindicated in alcoholism, hepatic or renal disease. While at treatment, fatty meals are harmful.

Percentage of worms removed. About ninety-nine per cent of parasites may be got rid of by one treatment. The drug is not to be repeated before three weeks have passed.

Oil Chenopodium. The safe adult dose appears to be near about two c.cm. though some workers advocate bigger ones. It is generally given like this. Carbohydrate meal the morning previous, a light meal in the afternoon, a saline purge at 8 p.m. the previous evening, next morning on an empty stomach—at about 7 a.m. one capsule containing about one c.cm., then in another hour, say at 8 a.m. another capsule, a saline purge three hours after, as in the case of carbontetrachloride.

Sometimes 1.5 c.cm. of carbon tetrachloride and one c.cm. of oil chenopodium are shaken together and given all at once to an adult to be followed in an hour's time by a saline purge. This drug alone though not so very efficacious against ankylostoma, as carbon tetrachloride, yet it (oil chenopodium) has the special advantage that it also removes the round worms. It may be repeated in about twelve days' time.

For children. From the age the calculation is based on, one minim per year, minus one minim from the total number of minims, e.g., 10 years, 9 m; 12 yrs. 11 m; but after 16 years usually 20 minims, 19 to 20 years 24 minims. Children are more susceptible to this drug than adults. *Ascaridol* is also of some efficacy.

It may be dropped either on sugar or sugar plum, or syrup and then drunk off.

About ninety-eight per cent. of the worms are got rid of by this remedy. But both these drugs should be chemically pure and made of very dependable manufacturers.

Though text-books and workers in the line suggest bigger doses of the two drugs to be given to patients, yet the above dosage is *quite safe and effective* particularly for private patients.

Out of the older remedies, thymol and betanapthol, the former is used now and then.

Thymol. It is given more or less in the following manner to adults.

A saline purgative the previous evening. Next morning at 8 a.m. 30 grs. of thymol in a capsule, at 10 a.m. another such, then in another two hours say at about 12 a.m. a saline purgative.

Dosage. Under 5 years total 7 to 8 grs; 5 to 10 yrs. about 15 grs.; 10 to 15 yrs. 30 grs.; 15 to 20 yrs., 3 grams or 45 grains from 20 to 50 yrs. total of 4 grams of 60 grs.

Poisoning. Oil, fat, alcohol, help the absorption of the drug giving rise to poisoning, hence they should be avoided for two days before during and after treatment. Some workers have given 50 gr. maximum adult single dose with 25 grs. of magnesium carbonate and claim a cure of ninety per cent.

Contraindications to thymol treatment are, great debility, old age, pregnancy, advanced cardiac or renal disease, diarrhoea, dysentery etc.

Tetrachlorethylene. Manson[6] (1934) found three c.cm. to be less effective than four c.cm. doses in adults of this efficient but harmless, non-toxic remedy against anklyostomiasis. He has suggested three c.cm. of this and one c.cm. of oil chenopodium to be one of the best remedies for this infection, and he considers it to be as good if not better than carbon tetrachloride which may at times gives rise to symptoms of poisoning. The saline purgative may be given a few hours after the drug is given in the morning. Unless given in combination with oil chenopodium, some workers have dispensed with the clearing purge following tetrachlorethylene. Imperial chemical works are selling this now.

Some give it like this, 4 c.cm. of tetrachlorethylene shaken in one to two ounces of saturated solution of magnesium sulphate with 1 c.cm. of oil chenopodium added. Shaken very well in a bottle to make a very fine emulsion, then to be drunk off.

Hexyl resorcinol is very costly and not also so very effective as the above drugs.

Masses, require cheap but effective remedies.

Anaemia etc. Cruz[7] (1934) showed, that provided a good diet and iron are given in adequate doses to a patient suffering from heavy infection by ankylostoma, no anaemia develops, but once the diet is made poor and iron discontinued the anaemia reappears. So it is important that after a course of vermifuge treatment the patient should be given a thorough and prolonged anti-anaemic therapy, as discussed under the treatment of that condition by big doses or iron, dilute hydrochloric acid, protein rich diet, injections of liver extract etc. Unless this is done the convalescence may be unduly prolonged.

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6. Ind. Med. Gaz. (1934), 69: Sept. p. 500.
7. Riode Janero. Mem. Inst. Oswaldo, (1934), 28: July, p. 391.

Extremely anaemic or weak individuals are preferably treated first for their anaemia by all means, once he improves, treatment by the less injurious remedies like tetrachlorethylene or thymol is safer because in debilitated anaemic persons poisoning symptoms may follow easily.

Reinfection. This should always be prevented at all costs.

ASCARIS LUMBRICOIDES
(Round Worm)

The life history of these earthworm like adult parasites is not properly understood but probably the larvae[8] pass directly, into the stomach, through faecal contamination of the foods or drinks and through various ways enumerated at the beginning. In the intestines the larvae are set free the capsule of the ova having been digested and dissolved away, or the larvae are swallowed, who, piercing the intestines pass to the lungs, liver etc. In the lung they escape from the capillaries causing haemorrhages, passing from the air sacs to the bronchi, creep up the trachea and are then swallowed down via stomach into the intestines where they grow into adults.

During migration through lungs they might produce catarrh and bronchitis.

The mature parasites inhabit the small intestines, a few or many of them may be there. They may crawl up the stomach, oesophagus, trachea and give rise to corresponding groups of symptoms. They migrate more commonly in children, during fever. They may travel into the bile ducts,[8] gall-bladder, pancreatic ducts etc. May cause symptoms of intestinal obstruction, rarely they pierce the lumen of the gut to reach the peritoneum to set up peritonitis.

Symptoms. The symptoms are very variable and numerous. Pain round the umbilicus, gnashing of teeth, foul breath, diarrhoea of an intermittent type, and symptoms due to migration and obstruction by the parasites are common. Cerebral symptoms like convulsions, restlessness, irritability, twitching of muscles, picking at the nose are not at all uncommon. The coiled worms in the intestines may give rise to a palpable mass. One has seen cholera like symptoms in young patients with heavy infection by ascaris. Dysenteric symptoms may occur also.

8. Reginald Miller, (1936), Medical Annual, p. 511.

Diagnosis. Besides anaemia, eosinophilia and suggestive clinical findings, the only sure diagnostic point is in finding of the typical ova in the stools of the patient. They may have to be detected by a method of concentration. A barium meal and a skiagram of the intestines may show the string like opaque shadows with the barium inside the gut of the worms. This gives a very fine and characteristic picture.

TREATMENT

Santonin. The patient is given a preliminary purge in the noon and light diet such as milk, fried rice (Khoi) or rice and sugar, say at 7 p.m., a powder like the following taken twice or thrice at an interval of one to two hours.

Santonin	gr.	1
Hydrarg Subchloride	gr.	1
Soda Bicarbonate	upto gr.	4

one powder at hourly interval till two are taken at bed time for a boy of eight years, to be followed the next morning by a saline purgative. It is preferable that before exhibiting, santonin a preliminary purge and liquid diet is given, on the day of treatment. For an adult three to four grs. may be given, but in children has to be administered according to age. For a boy of two year 1/2 a grain twice, making a total of one grain. For three to four years total of one and a half grs., for four to eight years total two grs., ten to fourteen years total of three grains may be given. In the morning an effective dose of saline is to follow.

It is better that these drugs are exhibited rather on smaller doses than larger ones, because one may repeat them in two days time, if thought necessary.

The worms may continue to come out for days or later following the administration of the drug.

Sometimes santonin may produce yellow vision, reddish urine, giddiness, vertigo etc., and the patient when told of these before hand, may not get nervous at them.

Oil Chenopodium in suitable doses, as discussed under the treatment of ankylostomiasis, *or ascaridol*, may be given, followed in an hour's time by castor oil, or saline purgative.

Crystalline Hexylresorcinol.[9] Fifteen grains in a gelatin capsule for an adult and in half the dosage in children, early in the morning in an empty stomach and no diet for

9. Brown (1937 July) Am. J. Hyg. 26: p. 72.

six hours, followed by an effective dose of magnesium sulphate may be useful. Recently hexylresorcinol[10] is being sold under the name "crystoids" (Sharp and Dohme) and are ready tablets for use, said to be useful for all forms of round worms.

OXYURIS OR ENTEROBIUS VERMICULARIS
(Thread Worm)

General.

Though commonly found in children,[8] they may be met in persons of any age. The worm, enterobius vermicularis or pin worm, lives in the small intestines, when young, after having been hatched from ova swallowed, through food or drink. Finger nails are very important sources of infection by this worm specially in the case of children. They pick at the irritated anus and the ova stick into the nails to be taken along with food or drink or by sucking of the nails. The fertilised females, are about half an inch in length (the males being half of this) wander to the colon and into rectum also may come out of the anus in very large numbers. In females, specially in children, they may enter the vagina and cause vulvovaginitis. Due to their habit of nocturnal migration, they produce intense itching and irritation, specially at night, near about the anus. They may cause enuresis and frequency of micturition. This irritation draws the attention of the child to the perineum, genital organs, and thus initiation of masturbation is not unlikely. Colicy pain and other intestinal symptoms are quite common. The patient may become restless, irritable, disturbed in his sleep, may show loss of appetite and anaemia.

Diagnosis. This has got to be done by the microscopic examination of the stool and finding the typical ova of the parasites. The adult females or males may also come out specially after some purgative. The clinical manifestations are also suggestive.

TREATMENT

Any treatment to be radical, the mother or the nurse, must be made to understand about the mode of infection, specially that of reinfection.

10. Lamson (1936 Jan.) J. Pharmacol. and Expt. Therap. 56 : p. 63.

Under Gentian violet[11] *treatment* about 90 per cent cures were obtained in a series under institutional conditions. Now are available "Meroxyl" tablets (Wander), and contain gentian violet as properly coated pills. The violet tablets containing 0.03 g for children upto 16 years whole course of 40 tablets, and 0.05 g (forte) for adults course consists of 24 tablets.

Dosage upto 4 years—one tablet before break-fast, 5 to 7 years—one before break-fast another before dinner, both for 8 consecutive days.

Dosage according to age. Eight to ten years—1 tablet thrice daily—eleven to fourteen years, one—tablet, 2 at noon one at night, from fifteen to sixteen years one tablet before break-fast 2 each before lunch and dinner, all for 8 consecutive days. Give one weeks rest and repeat the above. Then examine the stools if ova present repeat treatment. For adults—one forte dragee thrice daily for eight days.

Toxic symptoms—like nausea abdominal pain may accur, but unless severe need not interfere with the course of treatment. The dosage may only have to be reduced temporarily.

Kill the parasites. The best way to kill these is by exhibiting one dose of 1/2 gr. each of santonin and hydrarg subchloride, on alternate nights at bed time, for three nights. This is suitable for a child of four to five years, simultaneously with oral medication the *lower bowel should be washed out* with a pint of warm tap water, containing *one to two heaped tea-spoonful of common salt.* After this the anus and the perineal region should be cleansed thoroughly and dried and the anus anointed with either 2.5 per cent white precipitate or blue ointment. If there is much local excoriation, five per cent anaesthesin or one per cent pantocain may be added to it. The night clothing should be such that direct scratching of the anus is not possible. While undertaking the treatment of several children in a family, one should insist on having their nails pared totally so that concealment of the ova therein becomes impossible. Hands should be thoroughly washed and the nails scrubbed with soap and water before meals.

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11. D'Antoni and Sawitz (1940 May) Am. Jour. Trop. Med. Balitimore p. 377.

Butalon. (Bayer) is a useful vermicide for enterobius infection. A patient of six years may take one tablet thrice daily. It helps in killing those worms which have escaped death at the previous treatment.

Colonic lavage has got to be repeated for six successive nights, to repeat the same course after one to two days rest. Then again test bowel washes may have to be given for a few consecutive nights and if any one of them indicate presence of worms, the whole course may have to be repeated. Infusum of quassia or 1 in 2,500 copper sulphate solution have been used, but hypertonic saline is one of the best for the purposes of irrigating the bowels. Usually what one unfortunately notices in practice is a lack in following up all these some-what hard measures, which few patients and parents adhere to strictly. When the irritation is very trouble-some, some half hearted measures are adopted only to be relaxed as soon as the child does not cause disturbance or complain much.

But we should insist on the proper scientific line of treatment and suggest the ways and means of preventing the *reinfection.*

TAPE WORMS (Taeniasis)
(Cestodes, Flat Worms)

There are three types, commonly met with, namely, T. solium, Linnaeus (1758) pork tape worms, T. Saginata or mediocanellata, Goeze (1782) (beef tape worm). Diphyllobothrium latum, Linnaeus (1758) fresh water fish tape worm. T. echinococcus. As they are not common, the treatment of infection by these will be considered very briefly.

Signs and symptoms there may be none or marked abdominal pain, nausea, diarrhoea, and anaemia, which may be very intense. The appetite may be capricious or ravenous. In nervous persons the constitutional disturbances may be considerable with marked mental depression. Convulsions though believed to be due to it, are rare.

Diagnosis.

Depends on the clinical history, eosinophilia, and finding of ova or segments in the stools.

TREATMENT

Though fresh extract of male fern (Extract filicis liquid) is lethal for the taenia, yet failure may be due to old extract, or it may be vomited out, as it is an irritant to the somach, and the capsules, cannot be swallowed except by the elderly children. For three days patient should be prepared by purges and keeping him on a low diet. The usual dose of the etherial-extract in 4 c.cm. in capsules, two such at an hourly interval in the morning, followed in two hours' time by a saline purge, are effective. In order to avoid nausea and vomiting the patient should, during treatment, lie quiet in bed. The bowels should be moved freely by salines, as oily purges are contraindicated.

A prescription like the following makes this nauseous drug somewhat suitable for oral administration.

Extract filicis liq.	m. 30
Egg yolk	q. s.
Syrup orange	upto fl. oz. half

one dose at hourly interval till three or utmost four doses are taken to be followed by salines purges. Though ninety drops are the usual total dose yet sometimes one hundred and twenty m. have been given.

Pelleticrine-tannate in powders of two grs. till three to four such are taken to be followed by a purge in an hour's time are useful. It is the active principle of pomegranate root, the root is taken in three ounce doses macerated in ten ounces of water, reduced to half its quantity. These five ounces may be taken in two doses hourly followed by saline purges. But it may produce colic.

Pumpkin seeds. Three ounces powdered and all taken at once, followed by a purge in an hour's time. Recently *tetrachlor-ethylene* in 4 c.cm. doses for an adult and 2 c.cm. for a child of eight years have been used with some success. It may be given well shaken with one to two ounces of saturated solution of magnesium sulphate, as in the treatment of hook worms. Six hours after its administration a dose of Epsom salt should be given. Previous purgation is useful. A fat free or low fat diet for a few days may be of use.

Filmaron. A compound of filicin in castor oil, in two to four drams or thymol in doses indicated in the treatment of hook worm may be tried as substitutes for the above, if they are not well tolerated.

The head of the worm must be seen to have come out, otherwise new segments will grow from it, and in about three months' time segments will come out again in stool. The valvulae conniventes usually protect the head of the parasite from the action of these drugs.

The proper cooking and regular inspection of meat, fish and clean habits are the *best preventives* to infection by these worms.

SOMATIC INFECTION BY PARASITES

CHAPTER LXVI

FILARIASIS

(Infection caused by Wuchereria bancrofti)

There are numerous apparently normal persons, who carry microfilaria in their blood. Due to low toxicity of these parasites there may be no symptoms in those with good resistance, whereas in the susceptibles there may be symptoms like urticaria, headache, slow fever, all may come in paroxysms, resembling anaphylactic shock. In the absence of malaria, fever coming with lymphangitis, and sometimes, red cord like swelling and inflammation of the lymphatics, if nocturnal in periodicity, and leaves off with profuse sweating, the diagnosis of filariasis, specially in the endenic zone, is very likely. Absence of palpable spleen, anaemia, jaundice, etc. may help in excluding the probable diagnosis of malaria.

Various filarial conditions develop in the endemic zone, according to the intensity of the infection, and resistance of the invidual attacked. Elephantiasis of the limbs, scrotum, breasts, chylocele, lymph varix, chyluria, hydrocele, etc. are quite common. Lymphangitis of the extremeties specially of the lower, or of the abdominal regions, orchitis, thickening of skin of scrotum, epididymitis, funiculitis, recurring periodically, are not infrequent manifestations of filarial infection. The dead worm is either eliminated by abscess formation or may remain calcified or be absorbed.

Diagnosis.

Has got to be made by examination of blood for the microfilariae. One of the best methods to examine, is to

take about twenty drops of the peripheral blood at mid night in ten c.cm. of a two per cent acetic acid solution. The blood is centrifuged and the deposit examined for embroyos. In chyluria the centrifuged deposit of the urine, in lymph varix or lymph scrotum one may examine the aspirated lymph, for the larval parasites. The microfilarae are generally encountered in the peripheral blood in the early stages of the infection, before the obstruction of lymphatics is complete, but they are as a rule absent, when elephantiasis[2] has set in. In chyluria they are almost invariably present in the blood, because the block is near the juxta-aortic region, where the free anastamosis of the lymphatics enable the microfilarae to reach the blood stream easily.

(2) *Eosinophilia* of about five to eighteen per cent may be noted at the earlier stages. With complete block there is no eosinophilia but polymorpho-nuclear leukocytosis, specially during an acute attack.

(3) *Complement fixation test*, with the Dirofilaria immitis antigen if positive, it indicates presence of toxin of the parasites.

(4) *Dermal test* with Dirofilaria immitis antigen. A positive reaction is an indication of filarial infection.

The defensive value of the reticulo-endothelial system is worked out by Clayton Lane,[3] (1937).

TREATMENT

GENERAL MEASURES.

Rest in bed, elevation, cooling lotions locally applied during the very acute stage of inflammation may be of relief. When cold applications are not soothing warmth may be comfortable. Mild aperients, diaphoretics and internal and external hydrotherapy for the fever are of benefit.

The recent idea of Grace[4] (1934) and De and Chatterjee[5] (1934) that lymphangitis is due to haemolytic streptococci

1. Ray, (1934), Ind. Med. Gaz. 69 : Oct. p. 554.
2. Low, Manson Bahr. and Walters, (1934), Lancet. ii. Sept. 8. p. 531.
3. Trans. Roy. Soc. Trop. M d. and Hyg., (1937), 31 : No. 1. p. 61.
4. Grace, (1934), Ibid. 28 : Nov. p. 259.
5. De and Chatterji, (1934), Ind. Med. Gaz. 69 : Oct. p. 421.

producing an erysipelas like lesion of the skin, in which the organisms probably reside. Whereas Acton and Rao[6] (1929) were of opinion that streptococci present in infected areas like the teeth, tonsils, intestines etc. caused the lymphangitis. They found that autovaccines from such infected material in gradually increasing doses were of benefit. Hence while treating these septic type of cases, a thorough examination of the patient to detect any septic foci has got to be made. The commoner sites of such infection are to be found in septic teeth, tonsils, sinuses, bowels, respiratory or genito-urinary system or the skin. These should all be eradicated and an autogenous vaccine made from the young cultures grown on most suitable media. A vaccine containing 100 million streptococci, and 500 millions each of staphylococcus aureus and albus per c.cm. is injected, beginning from 0.1 c.cm. gradually increased till 1 c.cm. is reached ultimately Other non specific proteins like milk-albumin, non-specific vaccines producing some febrile reaction, such as typhoid and coli group of bacilli, may do some good.

In, those cases, where the manifestations are due to toxicity of the filarial infection and not to secondary bacterial invasion, injections of *organic arsenicals or antimony* salts, may do good. The preparations used are soamin one to two grs. intramuscularly, twice a week, till about sixteen to thirty-two grains are given. But as a routine the urine of the patient should be carefully examined before soamin administration, because albumin and casts indicate improper power of the kidneys to excrete these arsenicals, with grave risks of poisoning. *Tryparsamide*[7] and fouadin have also been given with good results.

Antimony. Sodium antimony tartrate is used almost exactly as it is used for the treatment of kala-azar. Neostibosan or ureastibamine may also be tried with efficacy.

RESULTS NOT SO GOOD.

Both arsenic and antimony are of either doubtful or slight efficacy. Personally one is not much satisfied with their result, but they have got to be tried in the absence of any other better remedy.

6. Ibid. (1929), Aug. p. 421.
7. Chopra and Rao, (1929), Ibid., March. p. 130.

COMBINED TREATMENT.

In most of these cases a combined treatment by vaccines, or pyrogens and the metallic salts may be required to get any good result from our rather unsatisfactory treatment of this parasitic infection. Some reaction, such as fever, leukocytosis, etc. should be aimed at while treating by the vaccines or the non-specific proteins. The metallic salts should be pushed according to tolerance of the individual. Brisk febrile reactions may be of distinct value, when combined with the injection of metallic salts.

Elephantiasis. During the earlier period of its development, when the parts are still soft, local massage starting from the periphery of the limb towards proximal side, with comphorated or olive oil, thus facilitating removal of the inflammatory products, and followed by elastic bandaging commencing from the distal part of the limbs, may prevent the swelling from progressing too rapidly. This bandage should be kept on all the while the patient is up and about.

Chyluria. Compounds of arsenic or antimony mentioned above, have sometimes given good results in relieving this affection. A course of autogenous vaccines prepared from culture of either a catheter specimen or mid-stream urine may be of some use. Rest in bed and restriction of fats and fluids during treatment are of help. Liquid extract of "lodh" and hamamelidis (B.P.) each in dram doses, orally twice or thrice a day, are sometimes of use.

Filarial abscess. Hot boric or mag-sulph compress; when suitable opening up and aseptic dressing, a course of autogenous vaccine, and other forms of treatment indicated above are to be instituted.

Filarial hydrocele, scrotal tumour, etc., though may be treated in the above lines only as palliative but ultimately the surgeon's knife assures anything, if at all, like a radical cure. Recently hydrocele fluid containing microfilaria are being injected with variable result.

Prophylactic measures. Prevention of the mosquitoes from biting, to maintain resistance, prevent any trauma from resulting etc. are some of the best safe guards. One wonders if a high protein diet is a preventive to the development of elephantiasis. That to keep fit, is a good preventive, there is hardly any doubt.

COMMONER DISEASES OF THE URINARY TRACT

CHAPTER LXVII

URINARY CALCULI

(Stone in the urinary tract)

Diagnosis etc. The stones in the kidneys, renal pelvis, ureter, urinary bladder may result either from derivatives of the acid, alkaline, or neutral urine.[1] In alkaline urine as a result of infection locally in bladder or kidneys, stones of phosphates or carbonates of lime[2] are common, whereas in acid urine are found stones of uric acid, oxalate of lime, cystin or xanthin derivatives and others. Their size varies from a small gritty particle, sand or gravel to large stones that fill the whole pelvis and calices of the kidneys. In fact all the signs and symptoms of renal colic may be caused by these sands, specially by calcium oxalate crystals. An infection appears essential for stone formation also.

Larger stones may give rise to fewer symptoms than smaller ones. Local irritation by calculi, may cause frequent micturition, lumber pain, haematuria etc. Renovesical reflex is the cause of frequent micturition. In these cases, after hard labour, jolting, horse riding etc., there may appear red blood corpuscles in the urine. Albumin, red and white blood corpuscles are almost invariably present during or following an attack of renal colic.

Renal colic. The symptoms are more or less characteristic and often suggestive. A sudden unbearable pain, following hard labour, jolting, riding, radiates down the course of the ureters to the bladder, testes, lasting for variable period of time. Vomiting, chill, fever, sometimes anuria or haematuria may accompany. During the attack a small stone or gravels only, (in a bout of oxaluria) pass into the bladder or a larger sized one may obstruct the ureter leading, later on, to hydro-nephrosis. Not uncommonly the pain is referred to the contra-lateral kidney, as a reflex phenomenon.

For proper *diagnosis* besides an examination of the urine, skiagraphic examination after injection of uroselectan,

1. Counseller and Priestley, (1935), Jour. Amer. Med. Assoc. 104 : p. 1309.
2. Randall, (1936), Trans. Amer. Assoc. G. U. Surg. 29 : p. 323.

white blood count, stool examination for amoebiasic etc., may be of service. Acute or chronic infection of the urogenital tract, abuse of foods and drink, lead poisoning, indigestion, improper diet, specially lack of A vitamin, etc. are some of the probable contributory causes. History of previous attacks, urinary findings, total and differential white blood count may help.

Differentiation however has got to be made from acute typhlitis or perityphlitis, intestinal colic, acute dysentery etc., ruptured tubal pregnancy, torsion of the ovarian cyst, Dietl's crisis, and others.

TREATMENT

Renal Colic.

The first essential is a proper diagnosis. Once it is established, and the pain unbearable, a subcutaneous injection of morphine 1/4 gr. and atropine 1/100 gr. may be be of relief. A hot sitz bath upto the loins or a full warm immersion bath may be of service. The temperature of the bath-water should be gradually raised upto the limit of tolerance, as it is the warmth which by relieving spasm allays the pain. Locally hot poultice or cataplasma koalini may be of relief. When the unbearably acute stage is over, the heavinss may be relieved by a prescription like the following notably *when the urine is acid* in reaction.

Potassium citrate	gr.	30
Tr. belladonna	m.	8
Veramon	gr.	4
Luminal sodium	gr.	1
Pot Bromide	gr.	10
Syrup Orange	dr.	1
Chloroform water	upto oz.	1

one dose four times a day, the luminal may be omitted unless required. Eukodal or eupaco tablets may relieve pain.

If alkaline, the potassium citrate should be replaced by ammoniumchloride, one of the best acidifiers of the urine.

Tincture belladonna in big doses say eight to ten drops with half a dram of potassium citrate and ten grains each of bromide and chloral, every three hourly may be of help in these painful conditions.

Some workers have suggested inversion of the patient to dislodge the stones from the ureters. This may be tried where possible.

Barker (1934) suggests, for the relief of the colic a paravertebral injection of three to four c.cm. of a two per cent solution of novocain or tutocain, the needle being inserted between the twelfth thorasic and the first lumber vertebra and if necessary also at the levels of the intervertebral spaces above and below.

Corroll and his co-workers[3] (1940) injected 3 c.c. of pancreatic extract intramuscularly causing complete relief of the renal colic in about three minutes time. They consider it better than morphine and atropine which "relieve the pain by blocking the cerebral recognition of it, but don't in themselves release the spasm." Ten cases of impacted ureteral calculi[4] not responding to usual treatment were much benefited by intramuscular administration of 1.5 to 2 c.c. of pancreatic extract. Spasm and calculus pain[5] are equally relieved. "Depropanex" a deproteinated, pancreatic extract of "Sharp and Dohme" is available. It is useful also in vascular spasms.[6]

Between the attacks one should avoid constipation, hard labour, jolting, riding of horses or driving of motor cycles specially on rough roads etc. Saline purgatives, and drinking of plenty of water are of service. Such etiological factors, as oxaluria[7], etc., should be found out and properly treated, by alkalies, improvement of digestion, and small doses of magnesium salt, which make the crystals of oxalic acid more soluble. Purgatives, lessening of calcium or oxalate rich articles in diet, plenty of water may be useful against oxaluria.

Any infection of the urinary tract which can split up urea, such as strepto or staphylococci, or salmonella, proteus ammoniae etc., should be treated. Eradication of septic foci in the body helps towards radical treatment. A diet *deficient in A vitamin,* tends to cause stones, by changing the character of the epithelium of the kidneys, the urinary tract and also by improper excretion of these crystals.

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3. Corroll, Lewis et al (July 1940) Mississipi. Valley Med. Jour. 62 : p. 122.
4. Lazarus (Jan. 1940) Jour. Urol. 43 : p. 102.
5. Kirwin et al (Feb. 1944) Ibid. 51 : p. 132.
6. King (Dec. 1941) Indust. Med. 10 : p. 530.
7. Keyser, (1935), Jour. Amer. Med. Assco. 104 : p. 1299.

"Post mortem on rats fed on a diet deficient in vitamin A, for two hundred and fifty days, revealed in eighty-eight per cent presence of vesical calculi. If vitamin A alone was added to a deficient diet the formation of calculi was prevented."[8] Higgings[9] (1935) confirmed the above results in experimental dogs. Summing up the present position, Joly[10] (1934), at the annual oration of the American Urological association said. "I believe that the hypothesis that the stone is a deficiency disease is the most plausible. It gives a reason for the change in the incidence of urinary calculi during the past years." Hence comes the importance of exhibiting a liberal portion of A vitamin in the dietary, as a preventive and in certain cases as curative of renal calculi. Adexolin, haliverol, navitol, carotene in oil are good sources of A vitamin. These should be given thrice daily at the beginning for a month, then once a day for a month and a periodic test for A vitamin adequacy is to be made. As hyper-calcaemia of the blood tends to cause calculus formation one should not give extract of parathyroid,[11] calcium or D vitamin for a long period to a patient uninterruptedly.

Prolonged immobilisation[12] also may cause formation of stone, hence such treatments of fractures, or tuberculous lesions requiring very long rest and immobilisation should be undertaken with care, and the diet should be rich in A vitamin.[13]

In all cases of calculus of the urinary tract the diet should have very little of salt, condiments, dried fruits and vegetables, spinach, raisins, almonds, figs, olives, cherries, beets, carrots, cucumber, celery, rhubarb, melon, and pine apple.

How to flush a small calculus out.

Small stones could be got rid of by giving the patient about ten drops of tincture belladonna and twenty to thirty grains of citrate of potash every four hourly for one day,

8. Medical annual, (1937), p. 525.
9. Trans. Amer. Assoc. Gen.-urin. Surg. 18: p. 157,
10. Jour. of Urol. (1934), 32: p. 541.
11. Albright and Bloomberg, (1935), Jour. of Urol. 34: p. 1.
12. Key, (1936), Brit. Med. Jour. i, p. 1150.
13. McCarrison quoted by Bailey and Matheson. Recent advances in genito-urinary surgery, (1936), p. 59.

the next day these are pushed till there are mild symptoms of poisoning by blladonna, such as dry mouth, blurred vision, flushing etc., then the patient is given about five to six pints of water to drink in a short time. This treatment has caused the exit of small stones specially in the females whose urethral canal is rather wide and short. In males too it may do good.

Recently recurrent[14] stones are receiving great attention which is mainly the domain of surgeons.

CHAPTER LXVIII

PYELITIS

DIAGNOSIS ETC.

Though the term pyelitis means suppurative inflammation of the renal pelvis, yet there is almost invariably some accompanying inflammation of the ureter and bladder. It may be acute, sub-acute or chronic. Normally there are no bacteria in the urine, but the urinary tract may be invaded by various types of organisms of which bacillus coli,[1] is though the commonest yet occasionally staphylo, or strepto or gonoccci or other organisms may be the incriminating agents. During the process of excretion through the kidneys, typhoid group or tubercle bacilli and so on, may cause the infection of the renal pelvis. These infections may travel up by way of the urethra, thence from the bladder upwards or by way of the blood and lymphatic stream.

It commonly results from some stagnation to the flow of the urine, favouring the growth of the bacteria, due either to pregnancy, foreign bodies, calculus, tumour, stricture, developmental anomalies etc. The urine may be cloudy, containing albumin, mucous, epithelium and pus cells and is usually acid in reaction in coli, or tubercle or gonococcal infections and may be alkaline in strepto or staphylococcal or proteus invasion. The presence of the pus cells in a sample of urine is suggestive, but they may require detection by the microscope, if scanty. Microscopic examinatioon of the urinary deposit is the only sure means of the diagnosis.

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14. Higgins, (1936), Jour. of Urol. 35 : p. 494.
1. Lyon, (1934), Brit. Med. Jour. ii, Sept. 8, p. 454.

The amount of pus may vary from day to day and an apparent clearing up of the urine, for a day or two may mean nothing more than temporary retention of pus in some upper regions of the urinary tract.

In most of the cases, notably when acute, there are signs and symptoms of local inflammation as well as those of toxic absorption. There is fever, commonly with chill and rigor, pain in the lumber region may be severe. There may be painful and frequent micturition. The odour may be fishy in bacilluscoli infection. There may be polymorphonuclear leukocytosis in the blood and culture of the urine, catheter specimen in women, and carefully taken mid-stream sample in men, may show the incriminating organisms.

In addition to the above signs and symptoms when there are casts, and kidneys are tender, pyelonephritis is to be suspected. Not uncommonly there may result perinephric[2] abscesses from these conditions. Pyelitis may be common in pregnancy and diabetes.[3]

TREATMENT

Radical. All sources of local irritation and obstruction, which favour stagnation and infection, enumerated above, should be remedied wherever possible. The ascending infection from the bladder and the descending type caused by coli-typhoid group also should be attended to.

Rest, warmth etc. The patient needs be confined to bed, with warm protection over the lions, so long as the temperature is high. Subsidence of the painful frequent micturition may be also helpful in determining that the acuteness has subsided. He should be first allowed to sit up for a few hours then to stand up, as soon as the conditions reasonably permit. This erect position sometimes helps in the postural drainage of pus from the pelvis of the kidneys.

Food and drink.[4] At the beginning of acute febrile stage, plenty of bland liquids such as barley water, with either lemon juice and salt or with half and half of milk sweetened, may be to the liking and taste of the patient.

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2. Birchett, (1933), New Orlean. Med. and Sur. Jour 85 : p. 587-592.
3. Root, (1935), Jour. Amer. Med. Assoc. 104 : June 22 p. 2231.
4. Combes and others, (1937), Lancet. i. p. 1063.

Later on, as the condition improves one may add bread and butter, citrated or sour milk or curd formed by lactic-acid bacilli or by bacillus acidophilus. Fruit juice, lemon juice with glucose or sugar-candy water may help not only by diuresis but also by alkalinising the urine. Plenty of water or other drinks may be useful by promoting free drainage specially in alkaline treatment. Milk in the pure form is not suitable, but its preparations in the form of pudding or custard etc. may be allowed made from up to one pint. Butter-milk in moderation may be liked by the patient. Gradually as the patient improves, one may add small portions of fish, egg, vegetables etc., to make the meals bigger, nothing more than these is allowable unless the patient is fully convalescent. The butter milk and acidophilus group of organisms, help to keep intestinal flora, the direct cause of the infection, in check, hence their efficacy.

Bowels and Purgatives. Regulation of the bowels is an important item in the treatment because it is from the absorption or permeation from the intestinal bacterial flora that keeps the infection lighted up. Most useful purgative is half to one ounce of castor oil, provided there is not undue distaste for it. It may also be taken in the form of an emulsion as given in cases of amoebic dysentery. Subsequently or where the patient is weak, an enema of a pint or two of warm water to wash the bowels is all that may be required. This may have to be repeated daily at the acute stages and later on, on alternate days. In bad cases about ten ounces of warm olive oil enema through a rubber catheter high up may relieve the initial obstinate constipation. After the preliminary cleansing, the bowels may be kept regular by a prescription like the following.

Pot Bromide	gr.	10
Extract cascara sagrada liq.	m.	20
Tinct. hyoscyamus	m.	20
Pot. Citrate	gr.	30
Liq. Ammon Acetate	m.	120
Syrup orange	m.	60
Chloroform water	upto fl. oz.	1

one dose thrice or four time daily.

The above prescription contains pot. citrate and liq. ammon acetatis which are good diuretics and alkalinisers of the urine. To keep the bowels free is important because intestinal stagnation helps the absorption and infec-

tion of the renal pelvis by the intestinal bacteria. *Pain, fever.* Fever is best controlled by removal of the cause. But symptomatically tepid sponging is good. Sometimes for the pain analgesics like the following may be of use.

Aspirin	gr. 4
Phenacetin	gr. 2
Caffeine Citrate	gr. 1½
Soda Bicarbonate	upto gr. 15

one powder as required.

But those cases requiring sleep should have the caffeine citrate replaced by the same or lesser dose of luminal, because the caffeine by its cerebral stimulant action tends to keep the patient awake instead of promoting sleep. The other effective analgesics like veramon, anacin or saridon tablets, eupaco or eucodal both morphine derivatives may be taken too, with some relief.

For the *painful micturition* tincture hyoscyamus in twenty to thirty drops with potassium citrate in half to one dram, thrice daily may be useful, as alkaline urine is less irritating than an acid one.

Alkaline treatment. Until recently and before the importance of ketogenic diet and later mandelic acid was discovered the treatment of these conditions was by alkalinization of the urine and production of free diuresis by large quantities of water.[5] This treatment is effective and inexpensive, if properly carried out, notably during the early stages of the disease. In short it is like this :—

Potassium Citrate	gr. 60
Infusum gentian co. (concen.)	m. 60
Tr. Hyoscyamus	m. 30
Syrup zingiber	m. 60
Chloroform water	upto fl. oz. 1

The above mixture, containing one dram of citrate may have to be given every two to four hourly according to the case, till the urine is alkaline to litmus paper. Once it is alkaline, just enough of the above mixture, say half the dose every four hourly may have to be given, to keep the urine alkaline. Each specimen as passed, should be tested for alkalinity and if found acid, the dosage increased. For sulphonamide therapy of urinary infection page 31 should be consulted. For streptomycin therapy see page 66.

5. Ellis, (1935), Lancet. ii, p. 127.

The *urinary output* should be upto *one hundred ounces* per day anything lesser than this quantity is not likely to be effective. For this purpose the patient has got to drink atleast five to six pints of water a day. Isotonic sodium sulphate solution consisting of 42.85 g in one liter of distilled water given intravenously, but very slowly may prove an important and effective diuretic.[6]

Alkalosis, is not so much to be feared of, specially if the dosage of citrate is lowered only to bare maintenance of an alkaline reaction of the urine. Free diuresis causes *much* loss of sodium chloride from the system and weakness, cramps etc., signs of lack of salt content, may be prevented by the exhibition of sodium chloride orally, daily through food and drink. Barley water with lemon juice and salt to taste are useful not only helping the diuresis and alkalinising the urine by the citric-acid which is absorbed as alkalies, but also for the extra ration of salt.

Mandelic acid, Ketogenic and mineral acid treatment.

Cases resisting the above simple inexpensive alkaline diuretic line of treatment may have to be treated by acidifying the urine. The ketogenic diet treatment was originally introduced by Clark and Helmholz[7] (1931) and also by Helmholz (1935) and others;[8] treating a series of cases by a ketogenic diet they found the effective pH inhibiting growth of coli group, to be below 5.5. In this diet the proportion of fat was kept very high, with a low carbohydrate ratio. The main acidifier hydroxy-butyric acid resultant of the ketogenic diet when given orally was broken up in the small intestine[9] but mandelic acid was found to be a suitable substitute for it.[10]

If the fluid intake was limited to near about two pints in twenty-four hours, as more of it prevents proper acidity by diluting the urine, ammonium mandelate in forty five grains or two tea spoonfuls four times a day may be quite useful. Recent combinations of mandelic acid has

6. Dick, (1934), Edin, Med. Jour. 41 : p. 203. (Med. Chir. Trans).
7. Proc. Staff. Meet. Mayo Clin., (1931), 6: p. 605-609.
8. Jour. Amer. Med. Assoc., (1935), Sept. 7th. p. 778.
9. Rosenheim, (1935), Lancet. i. p. 1032.
10. Lyon and Dunlop, (1935), Brit. Med. Jour. ii, p. 1096.

obviated the necessity of administering ammonium chloride in big doses initially to render the urine acid (pH of about 5.3). Mandelix which is more pleasant to take and still advanced mandecal (B.D.H.) which is a calcium salt of mandelic acid, are used with success. Neoket or ammoket brand (Boots) compound mandelic acid granules when taken in two tea spoonfuls containing about three grams or forty five grs. of mandelic acid given four times a day with a small quantity of water after meals may be quite effective. There may be the additional requirement of another ten to twenty grains of ammonium chloride to be taken four times a day, in order to render the proper pH of the urine near about 5.3 along with treatment by the above products. If the treatment is carried out carefully, in the absence of any anatomical defect the urine is likely to be sterile in seven to fifteen days or in longer time.[11] There are numerous recent corroborations[12] of the more or less sure effectiveness of this line of treatment.

Like, all other effective methods of treatment unless the details are followed the results are not likely to be satisfactory. Active renal diseases contraindicate and renal irritation as evidenced by the appearance of albumin or red blood corpuscles in the urine, which were absent so long, may indicate stoppage, at least, temporarily, of this line of therapy. Nausea, vomiting may indicate too much of loss of alkali reserve and the ammonium chloride may have to be either reduced or stopped. The pH of the urine should preferably be tested by means of suitable indicator, chlorphenol paper[13] is quite useful for this purpose.

Mandelic acid treatment is better undertaken for the more resistant subacute cases, withstanding the alkaline diuretic regime, suitable for the acuter febrile stages. Alkaline urine and sulphonamides appear to afford quite useful results.

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11. Holling and Platt, (1936), Lancet, i, p. 769.
12. Manson-Bahr, (1936), Brit. Med. Jour. i, p. 438. and Lancet, (1936), i, p. 483.
13. Alstead, (1936), Edin. Med. Jour. May, p. 292,

Nitro-hydrochloric acid in the followinug doses is recommended by Crance and Maloney[14] (1935) for Escherichia Coli infection.

Acid nitro-hydrochloric (fort)	m. 240
Distill water	upto fl. oz. 4

one teaspoonful or dram in a cupful of water to be sipped through a tube after each meals, of having preferably an extra ratio of fat, and also the last thing at night. The workers advocate continuance of the treatment over one week after the culture of the urine has become sterile.

Hexamine or urotropine acts in acid urine by liberating formaldehyde, an effective germicidal. But being an irritant it occasionally produces haematuria, hence before actually proceeding to administer bigger doses of this remedy, the tolerance of the individual for it should preferably be determined, and then the dose increased. Initially acid sodium phosphate in twenty to thirty grains, four to five times a day was to be given to render the urine sufficiently acid to litmus paper, then the hexamine was given, but since the introduction of ammonium chloride as an acidifier of the urine one can give them in the same prescription, whereas acid sodium phosphate and hexamine in a prescription will liberate formalin and thus such administration is unsuitable.

Ammonium chloride	gr. 20 to 30
Hexamine	gr. 10 to 30
Syrup orange	m. 60
Peppermint water	upto fl. oz 1

one dose every four hourly.

Urotropine is quite effective provided the urine is acid and the dose therapeutically adequate, and gradually the maximum tolerated quantity is given. Cylotropin, is a combination with caffeine, may be of use. But while giving hexamine care should be taken to ensure an even and proportional distribution of the remedy, during the twenty-four hours of the day. It may also be given in a forty percent solution intravenously with glucose.

The actual position of the other widely advertised but less dependable urinary antiseptics except acriflavine and a few others is dealt with at the end of this chapter.

14. Jour. of Urol, (1935), 33 : p. 657.

Sulphonamide[15] treatment[16] after alkalinising the urine has been found useful, see page 31 for details.

Chronic Pyelitis. It usually results from the causes giving rise to the acute infection. Some organic mischief or defect is more likely to be at the base.

All these chronic cases resisting the average line of treatment, require cystoscopic examination. Urine should preferably be collected from each of the ureters separately to see if there is involvement of both or one of the pelves of the kidneys.

Besides the measures already detailed out under the heading of general management of cases of acute pyelitis, such as rest, warmth, care of the bowels, removal of septic faci in the body, one should try *autovaccines* made from the organisms recovered from the culture of the urine.

When there is a residual, *cystitis*, the pyelitis having cleared up already, *acriflavine* in capsules of two to four times a day may be given with good results. But to be effective the urine must be alkaline in reaction. Pyelitis of pregnancy often clears up under this treatment. For this cystitis, some very dilute but effective antiseptic such as one in five thousand solution either of silver nitrate or acriflavine may be utilised for daily washing the bladder out. Later on these washes may be given on alternate days. A one per cent boricacid lotion wash out for cystitis, may be followed by retention of a ten c.cm. of a ten per cent argyrol solution into the bladder.

The intractable cases of chronic cystitis in pregnancy may require 1 in 5000 solution of either silver nitrate or acriflavine to be instilled into the pelves of the kidneys for proper disinfection. But this requires skill and experience which is beyond the scope of the average practitioner.

URINARY ANTISEPTICS

Garrod[17] (1935) in his comprehensive study of the urinary antiseptics says "All these therapeutic agents are used rather with hope than with confidence."

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15. Colebrook and Purdie, (1937), Lancet, ii. p. 1237.
16. Cokkinis, (1938), Brit. Med. Jour. May 28th. p. 1151.
17. St. Bart's Hosp.-Rep., (1935), 68 : p. 72.

Hexamine has stood the test of nearly forty years, clinical experience. It acts by liberating formaldehyde in acid urine and when properly used is definitely bactericidal. Garrod showed in his studies, that the number of living bacteria steadily diminished during the first six hours, and in some cases complete sterilisation was possible in twenty four hours. It is the only drug possessing such efficacy amongst the whole series. We have found hexamine effective where sulphonamides have failed.

"Proprietory compounds, the chief constituent of which is hexamine, cystopurin, helmitol, cystoformin, cylotropin, and amphotropin, are amongst those which are advertised to the profession. Garrod has shown, experimentally at any rate, that none of these compounds possesses any advantage over hexamine itself."[18]

Hexyl Resorcinol. (Caprokol) is usually given in a solution of olive oil. Its rate of absorption and excretion vary greatly in individuals. "Its disinfectant action is inferior to hexamine."

Neotropin and Pyridium given in 1½ gr. tablets three or four times a day, imparts a very impressive deep orange colour to the urine. "Garrod found that there is no evidence that neotropin restrains bacterial growth." But several American urologists are satisfied "that pyridium is an antiseptic of quite exceptional value." But as they both are more or less similar in composition and action, their efficacy, specially in the light of the experimental work of Garrod, is doubtful.

Acriflavine. It exerts an effective antiseptic action against coli and staphylococci only in an alkaline urine. It is given in 0.2 g. or 3 grains in capsules, three to four times a day.

Mercurochrome. Mostly used as an antiseptic irrigator of the urinary tract. When used intravenously during its process of excretion it exerts an antiseptic action, which is said to be effective by many observers.

Methylene Blue in one to four gr. in a pill or capsule. "Garrod found that methylene blue had a bactericidal action superior to, or at least more lasting than, any other drug tested except hexamine."

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18. Medical Annual, (1937), p. 531.

Camphoric acid has a soothing effect[19] in neutral or alkaline urine, hence its usefulness in painful cystitis.

Ammonium Mandelate. Lyon and Dunlop (1936) suggest that in mandelic acid and its salts we have a really efficient urinary antiseptic. Its simplicity of administration and practical efficacy marks as an advancement in our therapeutics. The ammonium mandelate has obviated the unpleasant necessity of exhibiting the obnoxious drug ammonium chloride for acidifying the urine. Injection of penicilin and streptomyoin in suitable doses may do good against organisms sensitive to these respective antibiotics, during the process of excretion through the kidneys.

CHAPTER LXIX

ACUTE NEPHRITIS

DIAGNOSIS ETC.

Classification of nephritis is not within the scope of a work like, this, only the clinical conditions are dealt with, in the following chapters, and it should be remembered that classification is also arbitrary and not uncommnoly one condition might imperceptibly merge into the other.

Injury. Injurious substances like bacterial toxins,[1] metallic irritants, corrosive substances, may reach and damage the kidneys through circulation during the process of excretion, or as a process of generalised poisoning or infection. Focal sepsis,[2] local chilling, acute infections, allergic states and such like numerous other factors may add and damage the organs.

Diagnosis.—

In addition to the symptoms of the primary disease, such as tonsillitis, upper respiratory catarrh, and others indicated above, oedema generally appears around the eye-lids, specially noticeable in the morning after a period of rest in bed. It may spread.

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19. Schweitzer, (1936), Urol and Cutan. Rev. 40 : p. 84.
1. Seegal, Seegal and Lyttle, (1935), Jour Amer. Med. Assoc. 105 : p. 17.
2. Platt, (1932), Quart. Jour. Med. 1 : p. 499-510.

In *acute onset*, slight fever, pain or heaviness around the loins, may be vomiting, headache, even convulsions and other signs and symptoms of uraemia, may help the diagnosis. Cardio-vascular symptoms may also be encountered. Anuria, oliguria and smoky urine, indicate the presence of red blood corpuscles. The specific gravity is high, and loaded with albumin, which on boiling forms thick coagulum. There are casts or moulds of various types. If damage of an acute type to the glomeruli preponderates, mostly casts containing red-blood corpuscles and lateron other and mixed types of casts will be encountered. When tubular epithelium shares the main burnt of the disease, there will be encountered epithelial, fatty and other types of casts. But it should be stated clearly that damage of any part of a structural unit of the kidneys ultimately will, specially when the damage is repeated, cause total destruction of the unit to be replaced by fibrous tissue. The intimate relation between the cardiovascular system with the kidneys should not be lost sight of. There may be encountered in acute nephritis, temporary and less commonly permanently raised blood pressure and other associated changes.

The nervous system may be affected in numerous ways, due to uraemic manifestions. Haemorrhages, and albuminuric retinitis are not uncommon. An *ophthalmoscopic examination of the retina* must not be neglected. The determination of the non-protein nitrogen content and sodium chloride content of blood, blood pressure record etc. should be made before starting treatment.

Considering the great reserve power of the organs, specially when one remembers that only about a tenth of the organ works at a time and is sufficient to carry on the functional activity of the system, it is really a matter of wonder how they become incompetent.

The patient may die either due to spread of the oedema, inter-current infections, uraemia, or as a result of some other complication.

TREATMENT

Some important practical considerations in treatment are based on the fact that the kidneys are unable to do their function due to the underlying structural changes either predominantly in the glomeruli or in the tubes or interstitial spaces etc. As in all other inflammatory lesions, rest is

the best means for the repair of the structual damage, which also indirectly promotes the restoration of functional activity so also here we should give the inflamed organs as much rest as possible. We have besides rest, very little to influence acute kidney disease favourably. When one bears in mind that the main functions of the kidneys are to excrete end-products of protein metabolism, salts, water etc. we should limit and restrict to the minimum specially at the acute stages, the above articles of food and drink. But over the endogenous metabolism of the system we have very little control, and the burden thrown on the kidneys on this account is also not very inconsiderable. The proper treatment of the primary disease which has given rise to the nephritis is of importance. Besides these considerations the other lines of treatment are more or less symptomatic than radical.

Simultaneously with the rest in bed and along with the treatment, the *amount of the urine passed* should be noted and regular examination of this secretion should ascertain the state of inflammation in the kidneys.

Rest warmth etc. The patient should be strictly in bed at rest and kept warm. He should use a binder, preferably of flannel, jute flannel, or thick linen or some such suitable material, so that local chilling is avoided. This not infrequently is the direct precipitating cause of nephritis, during an attack of tonsillitis, or scabies etc. Chill helps not only to keep the inflammation active, but delays materially the recovery of the inflamed organs. No one who is likely to infect the patient should be allowed to come near. The upper respiratory passages and mouth should be kept clean.

Aperients. To promote excretion of fluid and other matebolites, which normally should have been excreted by the kidneys, one gives some saline purges. An ounce or half an ounce doses of saturated solution of *magnesium sulphate* in the morning or half to one dram of *pulv jalap compound* taken at night followed by Epsom salt in the morning serve this purpose very well. Some suggest that *fractional doses of hydrarg subchloride* at night may be followed in the morning by saline purgatives. But as the inflamed kidneys may find it difficult to excrete the hydrarg salts and thus may cause symptoms of mercurialism, this metallic purgative is better withheld, notably during the acute stages. *Seidlitz-powder, sodium sulphate,* may also

be useful, but none serves the purpose better than magnesium sulphate, because due to the exosmotic action of both the ions, this saline purge produces watery evacuation and helps excretion of nitrogen, thus relieving partly the functional burden of the kidneys.

Diet etc. Some believe in giving milk even upto three to four pints a day at the acute stage of nephritis. But, in the above quantity of milk there are about fifty to eighty grams of protein, the burden of whose excretion falls on the inflamed kidneys besides that of salt and water, hence it is not advisable to throw such strain on these acutely affected organs. But in this consideration we should also be partly guided by the consideration of the patient's stomach, appetite, nutrition etc. But during the first seven days 1½ pints of fluid in concentrated carbohydrates are the most that is allowable.

In acute stage the diet should be restricted mainly to carbohydrates, sweetened orange juice is very good for this, glucose, rice, potatoes, and other sugary foods are best indicated. Gradually as the acute stage passes generally in one to two weeks, the patient may be allowed diluted milk in half to one pint a day and its effects watched. Improvement as manifested in the excretion of more urine, say from ten to fifteen ounces in the acute stage, twenty ounces or thereabout, the percentage of albumin lessens and the red-blood cells and casts become scarce and the excretion of urea in urine increases slightly, justifying one, to exhibit four ounces of milk diluted with barley water, or sago, or sweetened Horlick's or Benger's, etc. every three to four hourly. This condition may come in about three weeks from onset.

With the improvemt of the kidney condition the gastro-intestional system improves and as the appetite, digestive power return, one may add, bread and butter or hot rice and butter, easily digestible non-irritating green leafy vegetables, which are specially useful for the anaemia, caused by the drainage of albumin in the urine and patient may be allowed one egg, along with the lacto-vegetarian and carbohydrate diet.

Bearing in mind the fact that the amount of protein, fluids and salts in the diet has got to be as low as possible, the exact type and amount of diet to be given in a particular case will depend not only on the condition of the gastro-

intestinal tract, but also upon his appetite, power of digestion and assimilation, tastes, likes, his former habits of dietary etc. A low diet helps in keeping the endogenous metabolism also low, thus giving greater rest to the kidneys notably in the acuter state of the disease.

But along with the gradual progress, as found out by the examination of the urine, the general condition of the patient and blood bio-chemistry, one may add more of fish, small portions of chicken, goat or lamb meat, and other suitable proteins. According to most workers in the line, about fifty grams of protein are allowable to the patient after one and a half to two months from the onset of acute nephritis.

Protein Diet. It must be clearly understood specially in view of the recent knowledge in the subject that the "amount of albumin in the urine is no indication whatsoever for the withholding of protein from the diet and extra ordinarily beneficial results are aften obtained by giving a protein rich diet to a patient who is passing comparatively large amounts of albumin in his urine."[3] Also when oedema tends not to diminish after a few weeks, even when the acute signs and symptoms are over, it is often of use to increase the amount of protein in the diet and restrict salt and water. This generally causes diuresis and helps to clear up the oedema. But to be on the safe side, whenever possible the non-protein nitrogen content of the patient's blood should form a guide and check to a liberal protein dietary.

The normal non-protein nitrogen content of average Indian patients is near-about twenty to thirty mg. per 100 c.cm. of blood. If in a particular case of nephritis it goes upto fifty or more one should be cautions in giving a protein rich diet. In insufficient function of the kidney, this figure rises higher, and in cases of actual uraemia it is higher still, and a high-protein diet is admittedly dangerous in such cases.

Oedema. During the acute stage is due to endocapillaritis and contains about one percent protein whereas later due to hypoproteinaemia contains 0.1 percent protein. This means in the later cases, hypoproteinaemia,[4] alteration of the permeability of the endothelial lining of the blood vessels, retention of sodium ions, water, other acid producing metabolites,

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3. Mac Lean, (1931), Index of treatment. Edited by Hutchison . p. 603. Wright Co.
4. Shelburne and Egloff, (1931), Arch. Int. Med. 45: July 1939, p. 51-69.

alteration of the hydrogen ion concentration, tissue asphyxia, altered lymph, and venous pressure, improper innervation etc. etc. But the pivotal point probably is the hypoproteinaemia, leading to improper quality of blood which in its turn is not suitable enough to maintain the nutrition of the endothelium, causing hyper-permeability and oedema. In these cases estimation of the non-protein nitrogen content and determination of the renal efficiency tests like urea clearance test are our guides as to the quantity of protein to be given in cases of nephritis, with oedema.

But as a rule these urea clearance and other tests are more important guides in the chronic stage of nephritis than during the acute or sub-acute state, because in these conditions the capacity of the kidneys to excrete urea is limited, hence these tests are not likely to be of much use. But the etimation of blood non-protein nitrogen content may be a good guide as to the real state of affairs.

But protein-rich diet[5] is the main and probably the most rational treatment of oedema of renal disease.[6,7] Recently Shelburne (1938) has reported successful treatment of renal oedema by the intravenous use of acacia solution. Intravenous use of protein hydrolysates and plasma transfusions when well tolerated may have promising result.

Salt and Water. It is the sodium ion which is retained in nephritis, hence all salts of sodium are contraindicated, whereas salts of calcium, potassium, ammonium are without any oedema producing effect.

Titro dietetic salt and selarom (Bayer) supposed not to contain sodium ions used fo- salt purposes in oedema, are not so useful in practice as were expected.

The patient's diets need not be so much *salt free* at the acute as at the sub-acute hydraemic stage. So also with water. It should be restrictedly given to the acute nephritic. During the acute stage about a pint or a little more, but as the power of excretion of water increases the

5. Mac Lean, (1927), Modern methods in the diagnosis and treatment of renal disease 3rd edition. Constable and Co.
6. Moller and others, (1928). Jour. Clin. Investi. vi. p. 427; 485.
7. Epstein, (1917), Jour. Amer. Med. Sci. 1917. 154: p. 638.

patient may be allowed more of water provided the oedema does not increase. In those cases where there is extra thirst, the patient may be allowed a drink of an ounce of glucose, juice of a lemon and one to two drams of potassium cirtrate in half a pint of water or better distilled water.

Curries and Condiments. Hot curries and condiments are preferably avoided specially if there is any acute manifestation. Later on too, they need be taken with care and utmost of moderation, as they may irritate the kidneys.

Alcohol is better avoided altogether, if taken at all, it should be taken in small quantities and that only after meals.

Diet and Albuminuria. Now-a-days it is more or less well recognised that albuminuria following an attack of acute nephiritis may be present for years or even for life, and yet the patient may possess efficient kidneys. When the clinical condition is good and the kidneys efficient as indicated by renal efficiency test and urine lacking in casts, the patient should be allowed an average diet with reasonable amount of protein ratio. In such cases under-feeding specially of proteins results in weakness, usually wrongly ascribed to albuminuria. When the kidneys are efficient as shown by blood N.P.N. and proper excretion of nitrogenous waste products, a liberal protein diet may not be contraindicated even in the presence of albuminuria.

Hot baths etc. In cases of marked oedema and scanty urine, baths of various types may prove gratifying, though they have very little influence in hastening recovery of inflamed or poisoned renal cells. The excretory function of the skin is not so pronounced as to relieve, the burden of the kidneys materially. But again hot sponging, hot wet packs, warm or hot air, or electric baths specially in the cold season, help in promoting sleep. These baths are sometimes very exhausting and should preferably be preceded by a dose of a stimulant mixture.

Alkaline Diuretics. Alkalies are probably of use, but how far diuretics are of any good in acute kidney disease there is reasonable doubt. As a matter of fact in acute nephritis the kidney cells are generally so much damaged that the excretion of one of the best diuretics namely urea, is practically very little. Along with improvement of the kidneys condition the diuretics may have some action. However in most cases, notably at the acute stage a prescription like the following one may be of some use.

Pot. Citrate	gr. 20
Pot. acetate	gr. 15
Liq. Ammon acetate	m. 90
Spt of nitrous ether	m. 5
Glucose	gr. 60
Infusum scopari	upto fl. oz. one

one dose thrice daily. MacLean[8] (1931) remarks "in all cases of uncomplicated nephritis both acute and chronic diuretics are of very little value." But lateron, diuretin or theobromine et sodii salicylate, theocin sodium acetate may be given provided care is taken to watch the effects of these diuretics on the kidneys and the system.

Pain about the loins. Fomentation, poultices, dry cupping, hot water bottle over the loins may be of use. Hot bricks wrapped in flannel, blanket, coarse linen have been used in out of the way places and in poor families.

Oedema lung or glottis. They have their respective lines of management, besides, one may inject atropine 1/100 gr. with adrenalin ½ c.cm. Diffusible stimulants like ammonia etc. given orally may do good too.

Decapsulation of the kidneys may be useful in the subacute stage, but not of much use in the acute condition.

Vomits. When very persistent, even after saline purges alkalies, glucose etc., food may have to be withheld for a few to twenty four hours, and the same lines of treatment as in other forms of vomiting adopted. The oedema of the stomach wall, due to ascites, may be relieved by the improvement of this condition, this is more common in the subacute hydraemic than in the acute stage.

Removal of the foci of infection. All possible sources of infection should be searched for and carefully removed. Tonsils, teeth, scabies or other skin lesions, should receive due attention. Any radical treatment of these, demanding surgical intervention, may have to be postponed till the acuter stages of the kidney disease have passed off.

Anaemia. It is best treated in the lines of management of secondary anaemia and the corresponding chapter is to be seen.

Such complications, like acute *Uraemia* or *cerebrovascular lesions or cardiac failure* should receive proper attention as discussed in their respective headings.

8. Index of Treatment. Hutchison, p. 606.

Anuria and oliguria. Though complete suppression of urine is rare except for a few hours, yet oliguria is rather common and if persistent, toxic uraemia may develop with increase of blood non-protein nitrogen. Though it may not be dangerous, provided the urinary secretion is established yet in cases of persistent oliguria one must be cautious. Anuria of more than a few hours duration should be taken seriously and if persistent, is of grave prognosis.

Twenty five per cent glucose 50 c.cm. with or without 10 percent solution of sodium chloride in 50 c.cm. per vein may help in establishing the flow of the urine.[9] Dry cupping or hot fomentation over loins may be of use.

Convalescence. Convalescence and after care should be very rigid, because a little carelessness in the form of chill, or cold, or cool bath may cause recurrence of the trouble. The anaemia should be treated so long as any trace of it persists. Other points regarding diet etc. are given above.

CHAPTER LXX

HYDRAEMIC NEPHRITIS

DIAGNOSIS ETC.

Underlying pathological change though variable, there may be sub-acute inflammation mostly of the parenchyma, not uncommonly the result of repeated acute attacks. There is some line of demarcation between the acute and this condition, yet hydraemia,[1] when pronounced, the lines of therapy are more or less clear.

The patient has a large white face with a large white kidney. There are anasarca, anaemia, hydrothorax, hydropericardium, ascites and so on. The course of the disease is variable from a few months to two years or longer, resulting either in cure or chronicity. Those who survive may die of spreading oedema, infections, incompetence of the kidneys.

The urine is scantier, ranging to about ten, twenty to thirty ounces or lesser, moderate albuminuria with high spe-

9. Wesselhoeft (1941), Jour. Amer. Med. Assoc. 116: (January 4th) 6. 37.
1. Platt, (1936), Brit. Med. Jour. i, p. 987.

fic gravity. There may be fatty, or epithelial, or other casts. Red blood cells or casts present at the acute stage may be absent or scarce, so also are the granular casts indicative of chronic change. The non-protein nitrogen content though, usually low, and the eye grounds not much affected, there is invariable retention of sodium ions and water. The normal salt concentration of the fluid in which the tissues are bathed is 0.6 per cent., any excess or reduction is equalised either by retention or excretion of watery content. Every 0.6 g. of salt when retained favours retention of about hundred c.cm. of water in the system. Hence the rationale of a salt free and water poor diet. Water, if given liberally, is poorly excreted and mostly retained, to equalise the osmotic pressure exerted by sodium ions retained, with increase of oedema.

TREATMENT

General etc.

The total quantity of urine passed during the day, its percentage of albumin, pulse, temperature, blood-pressue, body weight etc. should be noted regularly. Body weight forms a good guide as to the result of treatment, notably from the point of reduction of oedema.

Rest, warmth, removal of sepsis etc. The same details should be followed regarding rest and warmth as in acute nephritis. All septic foci should be removed, the mouth, throat, teeth kept clean. Persons suffering from any communicable infectious diseases, or naso-respiratory catarrh, should be kept away from the patient. Water bed or air cushions or air beds may prevent bed sores at points of pressure, particularly in very oedematous persons. A cradle to keep the weight of the blankets off the patient's legs and the body may prove of comfort. A back rest may be helpful for him.

Oedema. Provided, the non-protein nitrogen content of the patient's blood is not high, and urea excretion is not much impaired, a satisfactory line of treatment of oedema, lies in exhibition of a protein rich diet. Transfusions of protein hydrolysates, plasma etc. appear to have a promising future, but must be given cautiously.

If the non-protein nitrogen content of the blood of the patient is high, a protein rich diet is not likely to do much good and may do harm by still increasing blood N.P.N. and thus precipitate uraemia.

In suitable cases meat, fish, eggs, cheese, beans, milk casein, milk preparations, sweets like sondesh and rasogolla, etc. may be given. On the first few days the patient may be given four ounces of milk every four hourly. After a week or so one soft boiled egg and a piece of toast added. Gradually more of toast, vegetables may be added, along with it the quantity of milk reduced and fish meat, eggs in various forms exhibited. These cause diuresis and help in reducing oedema. Fats should be given rather sparingly. Milk and its preparations and milk casein are very useful orally.

A salt free diet, without extra salt being allowed either for cooking or at the table. The meat or fish is very suitably taken fried or roasted, as when boiled due to insipidity, they are difficult to take without additional salt. Potassium or ammonium chloride, and lemon juice sprinkled over the meat or fish may impart a little taste and help in reducing the insipidity. If the digestion and appetite of the patient are good, he may be granted quite a liberal high-protein diet. The advent of a good diuresis often heralds the beneficial action of such a diet, and the patient gets dried up. Gradually when oedema free, the protein content in the diet should be reduced and other substances like carbohydrates fats, vegetables etc. added and the effects watched. Any increase of oedema indicates a resumption of high-protein diet. During the cured condition, after the oedema has disappeared, the patient should get nearly his normal share of about fifty to sixty grams of protein per day. Should this protein-rich diet prove unsuccessful in reducing oedema, and if there appears any other trouble such as loss of appetite, such dietary may have to be given up, after trial for a reasonable period of a few weeks to months. Longer time, for improvement will naturally be taken by those cases in which either tapping out of the albumin rich fluid, or draining in the urine for a long time, has caused great loss in albumin content of the blood. Milk and milk casein (chana) are important articles of diet and are very useful in this condition.

Paracentesis. From theoretical considerations, and from actual cases in practice one is against draining out from the peritoneai cavity of such an albumin rich fluid accumulated in the course of these hydraemic states. Once these cases are tapped a few times, entailing much draining of valuable albumin content, which keeps the oncotic pressure of the

blood, there is considerable difficulty in regaining the whole amount of this fraction of blood through dietetic regime alone, and if at all, with consequent great delay in getting improvement through high-proten diet.Now-a-days the ascitic fluid is being reinjected intravenously with proper aseptic precautions with some effect.

Water restriction. Water need not be very drastically curtailed, but an amount in excess to the quantity of urine passed is not to be advocated, because the excess is likely to be retained in the tissues with increase of oedema.

Urea etc. Though MacLean suggests that increased diuresis in this protein rich diet is due to greater output of urea with its consequent diuretic effect, yet this is probably not the whole truth.

The usefulness of a protein rich diet is best illustrated in the recent experimental evidence of Shelburne (1938). According to this worker.[2] "The principal fault in the nephrotic syndrome is the loss of protein through damaged glomeruli. The proteins in the blood plasma decrease, so the effective osmotic pressure of the plasma is decreased and an abnormal amount of fluid escapes into the tissues producing oedema. This condition appears only after much of the body protein, such as in muscles, has been depleted."

Urea given in two to four drams twice daily may be effective in causing a good diuresis. It is given in a prescription like the following.

Urea	gr. 120
Tincture orange	m. 10
Glucose	gr. 60
Chlorofom water	upto fl. oz. 2

one dose twice or thrice a day. Urea after being exhibited for a week should be stopped for two to three days then given again. The days, without this remedy help in excretion of any retained urea in the system. A combined high protein diet with adequate doses of urea are, sometimes the best, for the oedematous patient. When the above regime of a few weeks to months fail to improve the hydraemia, probably it is not likely to do much. A poor sloppy diet is generally unsuitable for such cases.

Alkalies and Diuretics. If the pulse is unusually quick and there is involvement of the heart, Guy's pill given thrice daily may do some good. But due to its mercurial content

2. Jour. Amer. Med. Assoc. (1938), April 9th, p. 1173

good care should be taken of the teeth. For the purpose of diuresis a prescription like the one given in acute nephritis with the addition of one dram of urea per dose may do good. *Aperients and purgatives* are given as in acute disease. Magsulph is of special use in oedema.

Thiocin sodium acetate in two to four grs. twice or thrice daily may promote diuresis provided the acute symptoms have subsided and the permeability of the kidneys is established. *Diuretin* in four to eight grs. twice or thrice a day, may also help in greater flow of the urine. As all these preparations are more or less irritants to the kidneys hence they should be exhibited with caution, with an eye on their probable harmful effects, which are, in exciting an acute irritation and consequent worsening of signs and symptoms.

Salyrgan. It may also be given with proper precaution, as in the chapter on cirrhosis of liver. Novurit rectally may also produce profuse diuresis and thus improve the oedema. Any acute symptoms or signs generally contra-indicate the use of these mercurial diuretics which are more or less irritants to the kidneys.

Baths, saline purgatives and mechanical devices for withdrawal of fluid as indicated in the treatment of acute nephritis may be applied in these cases sometimes with greater advantage, than in the acute state.

Anaemia. This is particularly prominent in these cases, hence the greater usefulness of big doses of iron, as in acute nephritis, and Basham's mixture may be of use here when extra iron is given, as in hypochromic anaemia.

Intravenous use of acacia solution. "Hartmann[3] and others (1933) presented a series of cases of the nephrotic syndrome in children in which he raised the osmotic pressure of the plasma effectively by giving large amounts of acacia intravenously and profuse diuresis resulted."

The solution of acacia given,[4] was thirty grams in one hundred c.cm. of redistilled water with another hundred c.cm. of it added. It has got to be repeated on alternate days

3. Hartmann and others, (1933), Jour. Amer. Med. Assoc. Jan. 28, 100: p. 251.
4 Dick and others, (1935), Ibid. August 31: p. 654.

or every fourth day or so. Along with this if a high protein diet is instituted from the very beginning, three to four such intravenous injections, at one to three days' interval are often sufficient to clear up the oedema. In bad and intractable cases resisting other forms of treatment this line is worth a trial. Human plasma transfusions repeated as required is expected to afford better results so also protein hydrolysates.

Decapsulation of the kidneys. In obstinate cases resisting all possible medical treatment, decapsulation of the kidneys done by a competent surgeon may be worth a trial. But before the operation, the non-protein nitrogen content of the blood of the patient should always be determined, as cases showing retention of the above, may not be benefited by this operation.

END RESULTS.

The prognosis and end results of even successfully treated cases are not always satisfactory. Some get recurrences due to persisting albuminuria, low protein diet, cold, chilling, exacerbation of tonsillitis, itches, scabies, etc. Others may pass insidiously into the stage of contracted kidneys, which become ultimately functionally incompetent leading to death.

CHAPTER LXXI

NEPHROSIS

DIAGNOSIS ETC.

This lipoid nephrosis usually results from degeneration of the tubules, the glomeruli being more or less unaffected, probably as an effect of some infective process causing degeneration of the glomerular membrane, with increased permeability to albumin but not to globulin or fibrinogen. The hypo-proteinaemia and lowered oncotic pressure of blood and associated changes cause oedema, which may be very extreme. Some hold it to be a form of only degenerative change, but equally competent workers take it to be a sub-acute form of nephritis. Casts and red blood cells characteristic of nephritis are lacking in this, so is absence of subsequent hypertension.

Besides chronic albuminuria of copious quantity, there may be even extreme oedema, anasarca, hydrothorax etc. Recovery may be complete after months or years of suffering though some careful workers think it to be a form of nephritis leading ultimately even in years or decades[1] to contraction and incompetence of the organs. History of previous acute attacks with casts means nephritis and not nephrosis. The non-protein nitrogen content of blood is as a rule low, with very high blood cholesterol. Some hold, poor diet might be a contributory factor, and advocate high protein food.[2]

There are two common conditions which require distinguishing from nephrosis.

1. *Amyloid disease* with tuberculosis or suppurative lesions of long standing showing enlarged liver and spleen and diarrhoea.

2. *Syphilis* may also produce similar changes.

TREATMENT

General measures. These should be in the lines of hydraemic nephritis.

Diet. It should also be more or less as in nephritis with pronounded oedema. The protein diet should be gradually built no from a carbohydrate and sugary one. The length of time required for improvement will vary directly with the amount of *albumin already drained* out, the greater the loss the longer is likely to be the time taken for effective treatment by raising the albumin content of blood. Diet should be built up according to the appetite, digestibility, etc. of the patient.

Fluid and salt. Both should be restricted, as in cases of hydraemic nephritis. Diuretics should be given in the lines of nephritis with oedema. Potassium citrate and bicarbonate are of special use.[3] Injections of acacia[4] may be quite

1. Lyon and Dunlop, (1935), Edin. Med. Jour. 42: Sept. p. 389.
2. Hawes and Vardy, (1935), Quart. Jour. Med. 55: Jan. 1.
3. Tidy, (1936), Med. Annual. p. 382.
4. Barach and Boyd, (1934), Amer. Jour. Med. Sci. 190: p. 536.

useful as in hydraemic nephritis. Human plasma and protein hydrolysates, even ascitic fluid per vein may be given with some variable good.

Iron, other remedies. Iron in massive doses, with dilute hydrochloric acid, extracts of liver by injection, etc. may be of use. *Extract thyroid* siccum beginning from half a grain increased upto ten grains, or 1/60 gr. of *thyroxine*, in between meals, twice daily may be useful. But if thyroid medication for a few weeks does not produce improvement or diuresis or if any undue tachycardia, palpitation, tremor sleeplessness, and so on, indicative of intoxication appear, the drug should be stopped at least temporarily and the effects watched. Thyroid diminishes the hyper-cholesterolaemia and raises the basal metabolism, both of which are affected in nephrosis.

Mechanical removal of oedema should be in the lines of nephritis. Sweating may reduce oedema very slightly, but there is risk of inducing undue weakness.

Septic foci. The major causative agent namely the septic foci should be eradicated. Unless the underlying factors are remedied, no amount of symptomatic treatment will be of any permanent value. Such infecions may lurk in the teeth, tonsils, appendix, gall-bladder, the sinuses, mastoid, tonsillitis or middle ear, skin etc. Tonsillitis appears to be associated more commonly with nephritis than nephrosis. The permanency of a cure depends on the possibility of complete eradication of septic foci, the earlier it is done in the course of disease, the better is the outlook of a permanent cure.

End results. Not uncommonly these cases are carried away through acute infections, caused by various organisms, amongst which pneumococci are the most frequent. The lowered resistance of the weak anaemic system due to drainage of albumin forms a very suitable ground for pneumococci to produce pneumonia, pericarditis, meningitis, arthritis, empyema, peritonitis, parotitis etc. etc. However hopeless a particular case may appear, on the face of it, with such a complication, one should not lose heart, and surprisingly, cases have recovered from nephrosis after they have successfully with-stood such febrile attacks.

CHAPTER LXXII

CHRONIC NEPHRITIS & URAEMIA
(Azotaemic Nephritis)

DIAGNOSIS ETC.

In this condition, the kidneys are usually contracted and may have resulted primarily from inflammation, or toxic degeneration or vascular changes. In some of these cases there may operate a combination of the above aetiological factors. In all these changes constant effort is made to regenerate the damaged tissues specially in inflammations of the parenchyma of the kidneys. Repeated inflammations or injury destory and obliterate the tubules or the glomeruli and gradual replacement fibrosis leads to contracted organs.

Chronic nephritis may in young persons or in children give rise to failure of growth, socalled "renal dwarfism." In young or middle aged adults it may result from repeated inflammations or other injuries to the kidneys. In women pregnancy[1] albuminuria, repeated in successive pregnancies, persisting for some time may lead to this state of the organs. In persons between forty to fifty years of age due probably primarily to vascular changes nephrosclerosis results and may be the cause of clinical phenomena named as malignant hypertension.

But there is another group of cases aged from sixty to seventy years, who though may show occasional albuminuria, yet seldom go to ultimate renal failure.

The kidneys, as a rule at this contracted stage lose the power to excrete the nitrogenous waste products and fail to concentrate the urine, hence they tend to be retained in the blood, and is thus called the azotaemic nephritis. McLean favours this name than any others. The urine is much larger than normal in quantity. The specific gravity is low, nearabout 1010 because the power of concentration by reabsorption through the tubules is lost.

Before proceeding to treatment the fundus oculi should be examined, the nonprotein nitrogen content of the blood, the systemic blood pressure determined. Also the urea concentration test and the test of the ability of the kidney tubules to reabsorb and thus concentrate the urine should be estimated.

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1. McKelvey and Mac Mahon, (1935), Surg. Gynecol and obst. 60: June. p. 1.

Urea Concentration test of MacLean is useful as a guide to competence of kidneys.

Ellis and Weiss[2] test for concentration of urine forms a suitable guide.

The patient rises several times at night to pass limpid pale urine. There is hypertrophy of the heart with usual signs and symptoms of hypertension, etc.

When the condition progresses slowly, life may be compatible for a few more years, termination usually resulting from either failure of the pump, failure of the filter and failure of the tubing, this means that cardiac failure, uraemia or apoplexy closes the scene. Retinitis generally means life extending not over a few months. High blood pressure, and retention of considerable non-protein nitrogen in blood are of bad significance.

TREATMENT

General points. The condition is, as a rule progressive and will terminate fatally, it is only possible in some cases to slow down the progress. So it appears wrong to interfere too much with the freedom and activities of the patient. He should live in moderation, avoiding all excesses, stresses and strains. If the patient is capable, he may be allowed to carry on his usual, but light work. In more progressive conditions rest in bed may be of use.

All acute infections, intercurrent diseases, focal sepsis, in tonsils teeth or any where when active tend to make the condition worse by rapid progress hence they should be remedied.

Diet. Though a lactovegetarian diet is indicated in most of these cases, yet the patient's nutrition should not be sacrified. If the test of functional capacity as indicated above, namely the urea and water concentration tests are within normal limits, the diet may be comparatively richer in protein than in those whose kidneys by test prove to be incompetent. Water may be allowed liberally and salt also need not necessarily be much cut down.

Morning. Milk one cup, bread and butter one to two pieces, a portion of some fruit. For Indian patients of the

2. Ellis and Weiss, (1933), Jour. Amer. Med. Assoc. March 25 : p. 875.

poorer classes fried rice or paddy, chapati, may take the place of bread. Tomatoes, germinating gram etc. which are cheap may be utilised for fruits.

Noon. Rice or chapati, vegetables, some small portion of fish or meat, some fruits if available. Milk, eggs, fruits and leafy vegetables are protective foods and are not injurous when taken in moderation.

The *afternoon meal* should be more or less as that of the morning and the *night meal* as the noon meals.

Tea should be taken in moderation and needs be very weak. *Meat, fish,* should either be in very small portions twice daily, say one ounce each time. *Alcohol* is better avoided as it causes vascular changes which in their turn are liable to make the kidney condition worse. *Fat* also should be given in small portions. Gravy, soups, and purin rich or other rich articles of diet like, brain, kidneys, sweet-bread etc., are better avoided. *Sugar and carbohydrates* and *vegetables* should form the main bulk of the patient's dietary. Eggs and cheese should be taken in moderation.

In severe or progressive cases the diet should be without any proteins for the first one month or two. Then as the condition improves the patient may be allowed about one to two ounces of protein on alternate days for a month and its effects on nonprotein nitrogen content, blood pressure etc., watched and the rest of the dietetic management will depend on the results so obtained.

Nature of food. The types of food specially proteins to be taken by the patient, will depend mainly upon his taste, liking, digestibility, appetite etc. For our Indian diet *milk and its preparations, fish, chicken, goat or lamb, milk casein, cheese, beans, lenlils, and* all sorts of vegetable proteins may be allowed in small or suitable portions. Eggs, fishes and their preparations are liked by many, but need be taken within the limits of excretory power of the kidneys. Fried or roasted protein preparations are better avoided, stewed, boiled things are more suitable as they are not liable so much to raise the blood pressure as the roasted or fried meat or fish etc., are likely to do.

The average Indian diet without much of meat or fish or other proteins is more or less suitable for most of these cases.

In actual practice, there is hardly any other subject in Medicine on which so much difference of opinion exists.

Platt[3] (1936) says "the protein intake should be restricted to the minimum necessary for the replacement of the tissue break down," whereas Mac Lean[4] (1931) is of opinion that "Inspite of the amount that has been written on the subject, it is still a matter of doubt to what extent protein diet is deliterious in azotaemic nephritis, specially in the milder and less progressive forms. In bad cases no doubt, protein should certainly be reduced, but the prevailing custom of cutting down the protein ration of patients suffering from mild chronic changes does much harm. Such patients become weak and anaemic, and suffer much more from the treatment than from from the disease. It is not uncommon to see patients who are alleged to be suffering from severe chronic nephritis kept for years on a very low sloppy diet; such patients are often thin, weedy and anaemic they certainly look ill but on testing their kidneys, the renal functions are often found to be satisfactory. These patients have been condemned to a rigid insufficient diet, perhaps on account of an albuminuria. When they are given an ordinary diet with the average amount of protein they often improve wonderfully, and in six weeks to two months they feel and look quite fit."

Hence for the practitioner the best plan would be to ascertain the degree of competency of the kidneys and give the diet accordingly.

Mode of life. All nephritics should as a rule avoid cold or chilling or getting soaked in rains. These tend to make the condition worse. Warm or reasonable clothing should be worn specially during the winter and in cold countries. For residence too, dry warm climate is better than cold damp regions. All strains mental or physical, should be avoided as far as possible.

Physical exercise. Moderate physical exercise is good. Golfing, walking, massage, breathing are suitable. Hard physical exertion tends to raise the blood pressure, hence should be avoided. Swimming in cold water, over exertion, cold bath, all are to be avoided, as they raise the blood pressure. Warm to tepid bath, breathing exercise, specially prolonged forced expiration may be useful, the latter may be of special use as it causes lowering of blood pressure.

3. Treatment in general practice, Vol. II; p. 393. Lewis publication.
4. Mac Lean, (1931), Hutchison's index of treatment. p. 611. John Wright & Sons. 1931.

Bowels. Bowels should be kept regularly active either by mild saline aperients like sodium sulphate or phosphate in two to four drams. But such household remedies like, decoction of (trifola jol) trifola or senna leaves, may be effective. Fruits like, apples, beal, papita, mangoes, bananas, stewed fruits, figs, etc., may act as mild laxatives. The habitual use of purgatives, may not prove satisfactory. If the blood pressure is raised, divided doses of hydrarg subchloride at night, followed by saturated solution of magnesium sulphate in half to one ounce the following morning may be of use.

Vitamins. The diet should not lack in the vitamins, specially A, B and C are of benefit.

Hypertension, headaches, restlessness or insomnia should be treated in their proper lines.

Heart attacks or cardiac failure. In these hypertensive subjects not uncommonly nocturnal distress or pain in the precordium may appear. Their treatment is discussed under the sudden acute circulatory disturbances. For any congestive type of failure, absolute rest in bed is the most important item in treatment. Fluids should be restricted to about one to two pints. Calcium diuretin or Rhodan calcium diuretin or simple diuretin in five to eight grs. thrice daily may do some good. Unless the pulse is quick digitalis group is not likely to be of use. Cardiac asthma is generally well treated by injections of morphine alone or in combination with atroprine. It may be given without fear. Even upto 1/4 grain may be injected. But about 1/6 gr. of morphine and 1/100 gr. of atropine sulphate may do good in these cardiac asthma cases. For the details the chapter on acute cardio-circulatory disturbances may be consulted.

Cerebral attacks or Hypertensive encephalopathy. In cases of hypertension with systolic blood pressure near about 200 and diastolic near about 120 to 130 mm. of mercury, attacks of severe headache, with vomiting, and blurring of vision or temporary blindness neuroretinopathy due to spasm of the retinal vessels may occur. Convulsions or fits are not uncommon either. They differ from uraemia by not showing much raised non-protein nitrogen content in blood.

During such an attack, the patiet should be confined to bed, and the diet should consist only of glucose, fruit juice, and fluids in moderation. The bowels should be washed bv

a high enema. Then about five ounces of fifty percent magnesium sulphate solution should be kept high in the bowels as a retention enema. This tends to reduce the intra-cranial pressure. In intractable head-ache, leeches applied on the temporal region may relieve the patient. In the absence of anaemia venesection upto eight to twelve ounces may be of relief. Morphine is not absolutely contra-indicated in this renal condition and may have to be tried, but with caution and in smaller doses.

Sedatives like half a dram each of chloral hydrate and potassium bromide rectally may be useful. Injections of one c.cm. of a twenty per cent solution of luminal may be helpful. After the attack is over, luminal, dial, ipral calcium or similar sedatives may be useful in preventing recurrences. Twenty grains of bromide and five grains of iodide in milk twice daily may be of use too.

Lumber puncture, and intravenous injection of hypertonic, say four percent saline 20 c.cm. may be tried.

Unfortunately these cases *ultimately* die of either tuberculosis of any organ or the serous cavities, or due to some inter-current disease, or due to the effects of hypertension or uraemia.

(Uraemia)

In chronic nephritis, this syndrome often terminates the scene. The changes taking place are due either to cardiac or renal failure or to hypertensive encephalopathy. There are though the clinical manifestations resulting from either one or more of the above pathological processes, yet the picture depends mainly upon the relative intensity of the three factors, enumerated above.

The development of the uraemic manifestations are more insidious than the onset of hypertensive crisis. General weakness, thirst, dryness of the mouth and skin, drowsiness, loss of appetite, headache, vomiting, tremor or twitching, anaemia, terminating into coma or convulsion, are the important groups of syndrome in uraemia. But vomiting and diarrhoea, in an elderly person with hypertension and foul tongue, should prompt the doctor to examine the urine of the patient, and a low specific graviy with traces of albumin and granular casts should cause suspicion, and determination of nonprotein nitrogen content of the blood, ophthalmoscopic examination of retina, and the blood pressure and

others, will establish the diagnosis. In these patients of uraemia not uncommonly the diarrhoea stops first then vomiting, whereas in ordinary infection of the gastro-intestinal tract vomiting stops first then the diarrhoea. *Cerebral* symptoms of various types, such as, monoplegia, hemiplegia aphasia, due to leakage from the cerebral blood vessels are not at all uncommon. Persistent headache of a very unbearable type, particularly coming in paroxysms, associated with vomiting, papilloedema, convulsion, temporary paralysis, mental excitement or confusion, mania, or symptoms of cerebral oedema or hypertensive cerebral attacks make the diagnosis probable. Cardiac failure may manifest in paroxysmal nocturnal dyspnoea, there may be oedema and effusion into the serous sacs. Generally the uraemic manifestations may be *respiratory, gastro-intestinal or cerebral.*

TREATMENT

Treatment is based mainly on symptoms, and as the latter may vary considerably, the most important point is to recognise the condition at its first onset and institute prompt and thorough treatment.

As soon as the diagnosis is made the patient should not get any thing for food except fruit juice, glucose, and liberal amounts, say about four or more pints of water per day.

Such dietetic restriction should be continued so long as required. But as a rule two to four weeks are usually enough to show either improvement or to terminate the picture. Five percent glucose solution in a pint or a pint and a half of *alkaline saline* may be given rectally by the Murphy's drip method twice a day, specially when there is vomiting.

Glucose should be given liberally, and as in the majority of these cases there is vomiting or purging or both, the only route left is intramuscularly but better per vein. If possible 200 c.cm. of a twenty five per cent or 400 c.cm. of a 12.5 to 10 per cent glucose solution should be given in twenty-four hours, the former per vein the latter intramuscularly. A two way syringe, with side branch, is very suitable to give these bulky intravenous injections. This is like a record syringe with a short glass side-tube, branching from the main barrel, to which is attached a sterile rubber tubing of convenient length, leading to the flask containing sterile glucose solution kept at a higher level. But in actual practice

glucose is seldom given in more than wenty to forty c.cm. as the capacity of the common big syringes is not more than twenty c.cm. So a sterile funnel, with rubber tubing attached to the end of the nozzle, having a needle tied to the end may serve the purpose, by allowing any quantity of glucose to run either into the tissues or into the veins.

Alkalies. Intravenous injection of twenty c.cm. of a seven percent sodium bicarbonate solution every eight to twelve hourly may do good. Orally half a dram of potassium citrate, or sodium bicarbonate every four hourly may prove useful.

Saline purgatives and retention enema of magnesium sulphate solution as indicated in the treatment of chronic nephritis may do much good.

But Hirschfelder[5] (1934) and Brookfield[6] (1937) showed that increase of magnesium ion in serum may precipitate coma, notably when its excretion is poor.

Vomiting. This may have to be treated by washing out the stomach, and by saline purges etc. Medicinal anti-emetics are of no use. Glucose and alkalies by remedying the underlying metabolic anomly may improve this troublesome symptom.

Cardiac and cerebral attacks demnad the same line of management as is indicated in the chapter on chronic nephritis.

Elimination, by diuretics and diaphoretics may not be very suitable and effective.

COMMONER DISEASES OF HEART & CIRCULATION

CHAPTER LXXIII

ACUTE CARDIO-CIRCULATORY DISTURBANCES

DIAGNOSIS ETC.

There may be *two distinct forms* of circulatory disturbances of an acute nature.

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5. Jour. Amer. Med. Assoc., (1934), 102: p. 1138.
6. Quart. Jour. Med., (1937), 108: p. 1496.

In one type the venous return fails, due to inadequacy of peripheral vascular inflow. This is called peripheral vascular failure. In the other type, the propulsive power of the ventricles is impaired. In the first case, the heart does not get enough blood to pump, whereas in the other case, it cannot pump the blood it gets.[1] These two factors may combine, as in some cases of coronary thrombosis. This latter condition not only weakens the ventricle but may provoke a reflex paralysis of the vasomotor system as well.

Peripheral Vascular Failure.

Fainting. According to Lewis, the mechanism underlying these fainting attacks is sudden vaso-dilatation with a fall of blood-pressure and associated increased tone of the vagus, resulting in a slow pulse of about forty to sixty per minute. *Symptoms* are giddiness, pallor, coldness, soft, not uncommonly, a thready slow pulse, visual disturbances, nausea and sweating may occur. The unconsciousness may last for a few minutes or longer. Recovery is usually somewhat slow and gradual, recurrences may take place. *Predisposition, Age* etc. Undue heat, fatigue, recent illness and exertion, prolonged standing, over-crowded places, menstrual disturbance in women, may precipitate an attack. Persons of weak health or who have recently suffered from debilitating illnesses are very common subjects. Though it is common *in young prsons with healhy hearts,* yet it may occur in elderly individuals, or in subjects of aortic-incompetence or hypertension etc.

Vasovagal attacks. Though originally described by Gowers and is known as Gowers' syndrome, the mechanism of action appears almost the same as that in fainting fits. Vasovagal attacks show premonitory symptoms like lassitude, restlessness and even an anxiety state. The world may appear unreal, pallor appears, the limbs feel cold, epigastric discomfort and respiratory difficulty may be evident. Like fainting fits, the pulse gradually slows down and becomes smaller and less palpable till it disappears from the wrist to usher in the loss of consciousness. This stage may last

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1. Bedford, (1936), Modern Treatment in General Practice, Vol. I. p. 8. (Medical Press & Circular Publication). Edited by Wakely.

even for hours. They are common in persons of *middle age and one attack* generally predisposes to others. Any diarrhoea, abdominal distension, or acute diseases, may predispose to an attack. The premonitory mental disturbances, the gradual onset and prolonged fall of blood pressure *are* the distinct features of the vasovagal attacks.

Diagnosis.

Depends mainly on the history of previous attacks, and complete recovery thereform, with a more or less undisturbed history, and on the absence of organic heart disease. The possibility of cerebral vascular lesions, heat exhaustion and other causes of sudden unconsciousness should always be remembered and differentiated from these attacks.

Treatment of Peripheral Failure. The principles are to increase the volume of the circulating blood so that enough comes to the heart for its proper working, thus minimising the cerebral anaemia and to restore the vaso-motor tone.

The patient should be kept reasonably warm. The foot-end of the bed should be raised, and the limbs may be bandaged by a bandge, or by broad strips of linen derived from sheets or dhoti. Fifty to hundred c.cm. of a twenty-five to fifty per cent glucose solution given very slowly intravenously is a very efficient means of combating this condition. Adrenalin half a c.cm. intramuscularly is efficient and acts by quick contraction of the capillaries, and raises the blood pressure. Friction with cool sponges or towels, may help to raise the blood pressure. In prolonged cases, such as those due to 'vasovagal' attacks half a c.cm. of adrenalin chloride and quarter to half a grain of ephedrine may have to be injected intramuscularly. The transient but quick action of adrenalin is strengthened and fortified by the slow and sustained action of ephedrine. This may be repeated in very bad cases every three to four hourly. Cardiazol. and ephedrine one c.cm. may be also effctive, notably when any weakness of the myocardium is suspected. Nikethamide may also be useful in these cases.

In between attacks. The patient should lead a more healthy life, specially in the open air with moderate breathing exercises and avoid all mental and physical strains. He should have regular bowels and take sedatives like bromides in ten to twenty grains or luminal in half to one grain, according to indication. These subjects should also avoid all excesses, night keeping etc. Baths at suitable temperature may prove useful.

Acute Cardiac Failure. These are most commonly due to an abnormal rhythm being suddenly taken up by the heart. The assumption of this, too fast or too slow a rhythm suddenly, impairs the efficient pumping of the heart. *Ventricular* fibrillation, a state of inefficient quivering contraction of the ventricle amounting almost to paralysis of function, may be the cause of death in extensive coronary thrombosis, in chloroform anaesthesia and in rare cases of poisoning by digitalis. Sudden ventricular failure manifests in a variety of clinical symptoms, the commoner ones being syncope, dyspnoea, pre-cordial pain, palpitation etc.

Cardiac Syncope. The commoner causes are due to disturbances of rhythm. Paroxysmal tachycardia, having a very excessively quick rate may lead to syncope, due to improper and inefficient function of the myocardium causing cerebral anaemia. Rarely auricular flutter with pulse rate varying from two hundred to three hundred per minute may induce syncope.

Diagnosis of these conditions is mainly on the history of the case. The abrupt commencement with symptoms of failure or syncope and sudden or gradual attacks should suggest Adams Stokes syndrome and an electrocardiogram may solve the difficulty. When the ventricular rate falls near thirty per minute, syncopal attacks are liable to occur. Short periods of stoppage of the ventricular beats may cause pallor, fainting, giddiness etc. and when the pause is longer there may be unconsciousness. In cases of partial heartblock the pulse rate may be normal between the attacks.[2]

Cardiac Asthma. It is usually a manifestation of defeat of the ventricle, and occurs notably in hypertensive heart condition or in syphilitic or arteriosclerotic disease of the heart and the aorta or in coronary disease.

Cardiac asthma is probably due to sudden pulmonary engorgement, and some degree of oedema of the lungs also is noticed. The attacks generally come during the first hours of sleep and wakes the patient up. It causes rapid breathing, pronounced distress, anxiety, and there may be pallor, cyanosis, sweating and tachycardia or tachy-arrhythmia. Recovery is generally the rule.

2. Medical Annual, (1936), 'Heart-block' p. 229.

Acute Pulmonary Oedema, may complicate hypertension. The symptoms are sudden dyspnoea, dry cough, sense of oppression over the chest followed by copious frothy, blood tinged albuminous sputum; there may also be collapse.

Pulmonary Embolism. There is generally the history of the source of an embolus such as a thrombosed vein, recent surgical interference of the long bones or in orthopaedic surgery, or auricular fibrillation with a big clot in one of the auricles, may manifest cyanosis, dyspnoea, collapse, infarct, friction sound, haemoptysis, pain etc.

Acute Cardiac Symptoms with pain. Coronary thrombosis is by far the commonest cause of shock and even *collapse with cardiac failure and pain.* The patient should be asked to point out the site of pain with one finger.

Typical oppressive or anginoid pain on the precordium lasting for more than fifteen minutes to half an hour is highly suggestive of this condition. In most cases there is shock,[3] pallor, sweating, subnormal temperature, fall of blood pressure, or there may be symptoms of acute cardiac failure with dyspnoea, cyanosis, hurried respiration etc. The pulse may be regular, rapid but imperceptible. It may infrequently be irregular. Slight fever, and rarely in a few cases pericardial friction due to infarct may develop. Electrocardiogram[4] by the high take-off of T wave and the typical curve, are diagnostic and may solve the problem by helping in doubtful cases. This condition is, though common, specially in hypertensive diabetics and arteriosclerotics[5] yet, in non-diabetics, sugar appears in the urine during an attack. Sometimes pain in the abdomen or gall-bladder[6] has been confused with this condition.

Palpitation. Sudden onset of palpitation with symptoms of acute cardiac failure is most commonly due to some form of paroxysmal tachycardia or some such acute abnormal state of the heart, or may be due to gas in the stomach but without any symptom of heart failure.

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3. Smith, Rathe et al, (1935), Jour. Amer, Med. Assoc. 105 : p. 2.
4. Medical Annual, (1936). Coronary Artery Disease'. p. 143.
5. Raab and Rabinnovitz, (1936), Jour. Amer. Med. Assoc. 106 : p. 1705.
6. Boyd Campbell, (1936), Bri. Med. Jour. i, p. 781.

Proper Diagnosis. Before starting treatment of all these acute cardiopathies, *one thing is absolutely* essential *and that is correct diagnosis.* A reliable history, patient's previous state of health, or the history of similar previous attack or attacks etc. are useful diagnostic hints. All possible examinations of the heart, blood pressure, pulse, condition of the nerves, digestion, any previous disease, examination of the urine, eye · grounds, non-protein nitrogen content of blood and lastly electrocardiogram may be essential to come to a proper diagnosis. A Wassermann reaction of the blood, cerebrospinal fluid and lumber-puncture may be required. Syncope in the young is rarely serious but in the elderly, always *a guarded prognosis should be given,* as it may be due to hypertension or cardio vasomotor or cerebral vascular disease, or cardiac weakness or some other obscure condition.

Treatment of Paroxysmal Tachycardia, syncope with sudden rise of pulse rate. Pressure on the vagus in the neck may do some good. Holding the breath in, for some time when the patient is conscious, may be of some use in a few cases. *Quinidine.* One should test first the tolerance of the patient to quinidine, then four to eight grains thrice daily may have to be given. Such big doses often act as prophylactic too. Some cases may be benefited by intramuscular injection of this remedy. *Digitalin and Strophanthin.* These may be tried, by intramuscular injections. Strophanthin intravenously may prove dangerous, in some cases. *Pilocarpine or* Physostigmine in one twentieth to one sixth grain of the former as pilocarpine nitrate and one hundredth to one fiftieth grain of the latter, as physostigmine salicylate, given subacutaneously may be tried, when other simpler procedures prove ineffective.

Treatment of Syncope or Cardiac Failure with very slow Pulse. Ordinary heart block (incomplete) or Stokes-Adams Syndrome, or rarely complete heart-block may be the basis of his condition.

Adrenalin Chloride. In half to one c.cm. doses intramuscularly every few hours, may do much good. It acts by sympathetic stimulation and thus accelerating the pulse rate. *Adrephine.* The quick and sure action of adrenalin chloride may have to be fortified and strengthened by the

sustained action of ephedrine hydrochloride. Ephedrine is given as *Cardiazol Ephedrine* orally or by subcutaneous injection, may be of use where also there is myocardial weakness along with heart block. *Atropine*. Subcutaneously one hundredth to even one twentieth of a grain. Bigger doses are of more use in intractable cases. *Frank's Mixture*, consisting of two mg. of novatropine and 0.48 g. of euphyllin in twenty c.cm. of a forty per cent glucose solution, given intramuscularly daily for a few days to a few weeks may do much good, and is very much advocated by Barker,[7] in his book. *Potassium Iodide*, intramuscularly, better orally in cases suspected to be of syphilitic origin, given in five to twenty grains with milk to prevent iodism, thrice daily, after food, may do lasting good. Organic arsenicals are generally contraindicated in these syphilitic cases. They may be tried with caution, after thorough trial of potassium iodide, bismuth or mercury. *Barium Chloride* in very small doses increases the irritability of the heart and in some cases half a grain, thrice or four times a day may be effective, when even atropine and epinephrine have failed. Sometimes such big doses as two third or five sixth of a grain, four to six times a day, may have to be repeated for a few days to a week, for good therapeutic result. Smaller doses are not generally effective. The dose should be increased very gradually and cautiously. *Coronary Dilators*. Like euphyllin or theophyllin or lacarnol may do good, when judiciously given according to indication.

TREATMENT OF CARDIAC FAILURE OR SYNCOPE WITH PAIN. In the great majority of the cases the underlying *cause is coronary thrombosis;* treatment consists in :—

Rest, must be typhoid like,[8] the nurse or the attendant always should spare all efforts, as even turning on the bed may prove fatal at the earlier part of the attack. Propping up of the patient may be essential in cases showing dyspnoea and symptoms of cardiac decompensation. In bad cases this rest should be for four to six weeks or little longer. If the patient leaves bed early, recurrences may take place with very grave consequences. *For pain*. Morphine alone or in combination with atropine, specially when heart block is likely or has occurred, even upto one grain of the former,

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7. Barker, 'Treatment of Commoner Diseases' etc., (1934), p. 100: Lippincott.
8. Master, Dack and Jaffe, (1937). Jour. Amer. Med. Assoc. 21st Aug. 109: 8, p. 546.

in a few hours, may have to be given to relieve the pain effectively. Morphine and atropine should be continued so long as the pain lingers. Codeine phosphate orally or injections may be substituted where morphine is contra-indicated. Injections of eukodal for pain is also useful; orally also these tablets are of use. Dilaudid orally or by injection shows almost the same effect as that of morphine. It may also be used where there is risk of morphia habit. *Oxygen.* Inhalation of oxygen coming at a brisk rate, the ideal being two litres per minute, given through the nasal catheter, is often effective in relieving the pain in the heart. Pain *usually disappears in twenty-four to forty-eight hours, given absolute rest, morphine or combined morphine and atropine, inhalation of oxygen and injections of glucose.*, *Shock*, is almost invariably present and should be combated by warmth, plenty of fluids, intravenous glucose, morphine, adrephine and others. Once the coronary thrombosis has developed, *vasodilators* like nitroglycerine, nitrites are generally contra-indicated. *Dyspnoea*, is best relieved by intravenous injection of fifty per cent glucose solution, in fifty to hundred c.cm., every twelve to twenty four hours. Recently theophyllin-ethylenediamine in 0.1 to 0.4 g. dose was found useful.[9] *Coronary dilators.* Euphyllin[10] in 0.1 to 0.45 g. intramuscularly or orally or in bad cases euphyllin and concentrated glucose per vein may be of much use. Metaphyllin and theophylline have got the same uses. *Caffeine Sodium Benzoate*, in four to seven grains intramuscularly may have to be given not uncommonly, with benefit. *Lacarnol.* (Muscle extract, a coronary dilator). Injection of one c.cm. or more, orally double or three times the injectable dose may be used with advantage. *Cardiazol-Ephedrine*, may also be given orally or by injection in cases showing myocardial weakness. *Strychnine*, may have to be given where there is respiratory difficulty, subcutaneously 1/64 to 1/16 gr. or orally in bigger doses, may have to be repeated every six hourly. *Cardiac failure.* Cases of pitting of the legs under pressure or in the presence of fibrillation of the auricle or ventricle, is best treated by repeated doses of half to two grs. of quinidine. Bigger amounts may rupture

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9. Marais and Mc. Michael, (1937), Lancet, Aug. 21st p. 437.
10. Smith, Rathe and Paul, (1935), Arch. Int. Med. Dec., 56: p. 1250.

the heart. When failure symptoms accompany tachycardia, quinidine combined with digitalis group, also appears to be of much help.

Recently anticoagulants like heparin[11] or heparin in Pitkin menstruum inorder to legthen the short lasting effect of heparin[12] and dicumarol, the anti-coagulant principle of spoiled sweet clover hay[13] are being used with some success and promise in the treatment of coronary thrombosis. Heparin appears, (a) to act by[14] preventing the conversion of prothrombin to thrombin; (b) forms or strong antithrombin in conjunction with serum albumin; (c) prevents formation of thromboplastin from platelets. Dicumarol[15] available in India as "temperin" of Herts pharmaceuticals, acts mainly by prothrombin depressing effect. Hence when these remedies are used not only, determination of bleeding and coagulation time mostly for heparin therapy, and serum prothrombin time determination for control of dicumarol treatment appear imperative. The normal serum prothrombin time is nearly 16 seconds. This line of therapy entails the service of a laboratory and trained personnel, difficult to procure in out of the way places specially in India.

Heparin is given intravenously in urgent cases or intramuscularly in 100 to 150 mg initially to be repeated four hourly in smaller doses. The action usually lasts for 4 hours. The cost of treatment being very great a medium, called Pitkin menstruum was introduced which when mixed with heparin much slowed the excretion of this anticoagulant.

Dicumarol is given in the following[16] routine. 1. The patient must be hospitalised to control prothrombin time during treatment, early in the morning before it is given for day. 2. Preliminary intravenous papaverine with oxygen and

11. Loewe and Hirsch (1947 April 26), Jour. Am. Med. Assoc. p. 1263.
12. Loewe, Rosenblatt and Lederer (1942) Proc. Soc. Exper. Biol. Med. 50: p. 53.
13. Link et al (1940) J. Biol. chem. 136: p. 41. (1941), p. i, 21 : 513 etc.
14. Wright (1942) J. Path and Bact. 53: p. 255.
15. Wassermann and Stats (1943) Am. Jour. Med. Sci. 206: p. 466 etc.
16. Falk (1947 June 7), Jour. Am. Med. Assoc. 134: p. 491.

morphine where indicated. 3. After diagnosis determine prothrombin time and give 300 mg. of Dicumarol orally. 4. Repeat 300 mg daily after morning determination of prothrombin time until 50 percent is reached. 5. When 50 percent is reached give 100 mg each morning. 6. When 36 percent is reached stop therapy. 7. When rises above 35 percent give 50 to 100 mg daily. 8. Keep this level for 4 to 6 weeks. 9. If the prothrombin time level goes down to 15 percent haemorrhages are likely hence give 60 to 70 mg of synthetic K vitamin by injection. For other details the articles by Folk reference No. 15 and other articles should be consulted.

Diet. Low diet of eight hundred calories in the maximum for the first eight weeks is advocated.[17] Fluids only upto twelve hundred c.cm. are allowable. This is essential in stout persons with or without diabetes, the commonest subjects of this trouble. A full big meal often brings about pain on the precordium. Weight reducing diet is useful in fat people, with coronary thrombosis. *Bowels.* The patient should be asked not to strain at stools at all. It is better that no exertion is done for evacuation of the bowels, for the first three or four days. Subsequently a douche may have to be given very cautiously on alternate days to ensure easy motion, as straining may lead to heart failure. *Diuretics.* Diuretin may be of use in cases with oedema. Iodo-calcium diuretin is useful for its general action as a diuretic, with the anti-arteriosclerotic effect of iodide and coronary dilating action of theobromine.

Certain preventive measures. Prevention of hypertension. As about seventy-five per cent of these cases are subjects of hypertension, all efforts should be made to keep the blood pressure low. For this, besides other things a low caloric diet, of about eight hundred calories in total and also not more than one thousand c.cm. of fluids in food and drink are allowed. Salt should also be restricted. Lacto-vegetarian diet thus avoiding much of meat etc., may prove useful. *No one with any infection* of the naso-respiratory tract should come near the patient as he has a weak heart with a wound and lowered resistance. *Insulin.* Even in diabetic cases no insulin should be given, as injection of it

17. Master, (1935), Jour. Amer. Med. Assoc. August 3rd. p. 337.

increases the load on the heart by about twenty-five percent. *Rest.* As secondary complications tend to appear by the second week, it should be insisted that the patient must take absolute rest for at least four to eight weeks. Embolus hemiplegia may occur by the fourth week, if any exertion is made.

Fatality. Generally about two to three percent die in the primary attack. If a patient survives the first twenty-four hours, probably he will survive that attack. Generally hypertensives die in the first twenty-four to forty-eight hours.

Syphilitic cases. Syphilis is best treated by injections of bismuth and potassium iodide orally. Organic arsenicals are generally contraindicated, except after complete course of pot-iodide, bismuth or mercury have been tried.

Sleep. To promote sleep, theominal a combination of luminal, a hypnotic and theobromine a coronary dilator may be useful. Other suitable hypnotics may also be tried.

Treatment of cardiac asthma.[18] In hypertensive or syphilitic persons with hypertension, vasodilators and anti-syphilitic and other treatments may do some good. During the actual attack, nitroglycerine in half to two minims, or trinitrin 1/120 grain may be used with advantage.[19] Potassium iodide is useful during the intervals.

In others, *during the attack*, vasodilators, injections of morphine and atropine are useful. They are given generally in one fourth gr. of the former and one two hundredth gr. of the latter. In milder cases or where morphine is contra-indicated eukodal injections or orally, may be of service. Codeine also may be used for this purpose. Dilaudid may also be given a trial either orally or by injection.

Euphyllin group. Euphyllin or theophyllin or aminophyllin and similar coronary dilators with twenty-five per cent glucose are also of use. These have got to be given intravenously but very slowly. In cardiac asthma and pulmonary oedema, venesection[20] and withdrawing of about

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18. Harrison, Calhoun and Harrison, (1934), Arch. Int. Med., June. p. 911.
19. Smith, (1937), Jour. Amer. Med. Assoc. Aug. 28th. 109: p. 646.
20. Weiss, Soma and Robb, (1933), Ibid, June 10th. p. 1841.

eight to sixteen ounces of blood may afford prompt relief. In cases with a quick pulse and sypmtoms of decompensation, intravenous injection of *strophanthin one* hundredth to one two-hundred-and-fiftieth of a grain with concentrated glucose solution may give much relief. Once the acute attack is over, prolonged rest and digitalin and combating of the underlying cause may do much good to prevent a relapse. *Oxygen*. This should be given at a brisk rate in all these cases.

Palpitation due to paroxysmal tachycardia should be treated by adequate doses of quinidine orally. In bad cases injections of quinidine may have to be given as urgency requires. Palpitation commonly met with in young subjects may be due to indigestion and excess of gas in the stomach demanding proper treatment. Hypertension, threatening cardiac failure, may be preceded by palpitation and deserve proper measures.

Indiscriminate use of drugs. This is always to be deprecated in cases of acute cardio-circulatory failure. In all forms of painful dyspnoeic seizures generally, morphine and atropine are more indicated than strychnine and digitalin. In *fainting attacks*, adrenalin or better, adrenalin and ephedrine combined, when injected intramuscularly, give as a rule satisfactory results. *Strychnine* by itself probably has got very little action on the heart. About one twentieth grain of it is effective in syncope and peripheral failure. *Digitalis group* appear to have no action on peripheral type of circulatory failure, but is effective in congestive cardiac incompetence with engorged veins, congested lungs, oedema legs, enlarged liver etc. It acts almost like a specific in auricular fibrillation and flutter, and is often of value in cardiac asthma, and other conditions with circulatory incompetence showing a very quick pulse. For quick and effective use, the dose of these groups of drugs has got to be big. Orally ten grains of digitalis leaf, or two drachms of the freshly prepared tincture, or by intravenous injection of strophanthin one hundredth grain, or digoxin half a mg. with glucose, may be required.

Diet. During all these acute states, it should be limited to glucose-water and other liquid forms of carbohydrate. Solids should be taken only when the acute condition is over. Low caloric diet, upto eight hundred calories per day, is good for hypertensive stout subjects.

Extra Systoles, sometimes respond to big doses, say half to one drachm of potassium acetate, four to six times a day. The writer has treated several cases with success by this method. Probably the action is due to the excess of the potassium ions in the blood.

CHAPTER LXXIV

ARTERIOLO-SCLEROSIS & HYPERTENSION

General Consideration.

Though pathologically these two conditions differ from one another, yet the therapeutics of each other overlap to such an extent that their joint consideration is not unjustified.

The cause of arteriolosclerosis, though is a matter of conjecture, yet may be due to, 1. inflammatory processes of bacterial[1] origin, 2. degenerative changes as a result of old age, wear and tear, strenuous life, etc. 3. disturbances of cholesterol metabolism and internal[2,3], secretions, and repletion, overeating and many others.

It is really difficult to distinguish the relation between cause and effect, when hypertension and arteriolosclerosis coexist, but the general modern trend of opinion correlates hypertension with primary hypertrophic changes in the muscular wall of the smaller vessels and not uncommonly with arterio-capillary fibrosis in the kidneys and other organs.[4] A case of hypertension without any apparent cause is called *hyperpiesia, or essential hypertension.*

Any blood pressure which over 150 m.m. systolic and 100 m.m. diastolic, is abnormally high; the normal average of white males is roughly, at the age of twenty, 120 systolic and 79 diastolic, at thirty, 121 and 81, at forty, 125 and 83, at fifty 129 and 85, at sixty 134 and 87, respectively. The average *pulse pressures* at twenty and sixty five years are 41 and 49 m.m. respectively.[5] The readings are in m.m.

1. King, (1934), Calif. and Western. Med. 41 : p. 145.
2. Parkinson and Hoyle, (1934). Lancet, ii, p. 913.
3. Adson, Craig and Brown, (1936). Surg. Gynaecol. obst. Feb. p. 314.
4. Wesselow, (1934), Lancet, ii. p. 579, 636, 687.
5. Jour. Amer. Med. Assoc., (1935), June 15 : p. 2202.

According to Barker (1934) causes of high blood pressure in short are. 1. Chronic renal disease. 2. Increased intracranial pressure. 3. Graves' disease. 4. Aortic insufficiency. 5. Chronic polycythaemia. 6. Suprarenal tumour They might die of renal, cardiac or cerebral arterial failure. It is the diastolic pressure, which is important in determining if there would be much risk in any particular case.

Recently *essential hypertension* is being classified as benign and malignant. The benign phase is generally seen in persons above 45 years of age and the course not so rapid as in the malignant type. Diastolic pressure is usually below 130 m.m. of mercury, whereas in the malignant type this blood pressure is above 130 m.m. (diastolic) and the course is rapid and found in younger persons. A careful hypertensive of the benign type may carry on for 5 to 10 years or longer whereas in malignant phase the younger person may die of cerebral vascular lesions, or heart failure or coronary disease or uraemic manifestations etc. in 2 to 5 years or earlier. The underlying pathogenesis appears to be the arteriolosclerosis of the kidney and other vessels. The greater the blood pressure the worse are the symptomatology. *Hypertensive encephalopathy and neuroretinopathy are serious manifestations.*

Subjective Symptoms. These vary according to susceptibility of the individual, state of disease, progress of physical changes in the arteries, heart and kidneys. The *first group* may be due to too much of fullness of the vascular channels in various systems and organs:—Comprising of headache, giddiness, fullness in the head, tinnitus, insomnia, and even emotional disturbances. Pain in the back of the neck and occiput also may be present. There may be breathlessness palpitation, flushing, pain in the chest etc. The *second group* are more or less due to depressed nervous function, such as lassitude, exhaustion, physical weakness, syncopal attacks, failure to concentrate and impairment of memory and others. The later manifestations may be due to failure of the pump or the filter or the pipes. These resolve into cardiac failure, or uraemic manifestations; or apoplectic attacks.

Objective signs, are hardening and chord like change in arteries. There may be evidences of hypertrophy of the left ventricle a booming first sound at the apex. The aortic second

sound is accentuated. A high blood pressure is likely to be maximum[6] when there is coexisting renal disease. The lumen of the vessel gradually narrows down and intermittent claudication, angina or anginoid attacks, and even trophic disturbances leading to gangrene may be the terminal event. The skiagram shows deep shadows of the aorta and sometimes its dilatation also. Where myocardial involvement is suspected the electro-cardiogram may reveal unsuspected damage.

TREATMENT

General lines.

In the absence of a definite knowledge as to the etiology of this condition, it is not possible to adopt any suitable radical curative measures.[6] What is done, is only palliative to stay the course of the malady and to prolong the life of the patient. Due to widespread arteriolor changes all over the system, there is likelihood of a potential dysfunction of the organs, with their diminished reserve power, specially during stress and strain, hence the importance of avoiding them.

One has got to go into the habits of the patient, his occupational difficulties, his routine of life, including, age, exercise, rest, diet, intoxication, mental state etc. According to the seriousness of the case, and urgency of the symptoms it may be incumbent to advice a period of *complete* or *modified rest*[7] either at home of the patient, provided it is suitably comfortable, quiet and proper, or in an institution and subsequently, such a modification in his life as his nature, and type and duration of illness demand. *Warm* climates are better suited for hypertensives than colder ones. *Sea levels, specially for those who show respiratory difficulty* are suitable. Cool but dry hilly places are good for an average case, provided the altitude is not very high.

Relaxation of the mind and body goes a great deal to relieve the symptoms. This may entail the necessity of changing a very strenuous occupation to a comparatively light one. The business engagement of the patient, periods of rest and

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6 De, (1934), Reunion No. Medical College Magazine, Calcutta. p. 87-105.

7. Mosenthal, (1928), Jour. Amer. Med. Assoc. 91 : p. 698.

physical exercise should be reasonably balanced. Longer hours of sleep and rest are often of benefit. The patient *should rest in the recumbent posture* for at least half an hour to an hour after each principal meal preferably on his right side. All extra work, business extension, public life, should be avoided, specially by bad cases.

Subjects *proving refractory* to average treatment should have *complete holidays for three to six* months in a place suitable for his physical state. Experience has shown that these people are generally very keen on their work and unless very materially incapacitated will not agree to leave it. Hence it is imperative that the whole situation should be explained to them and thus induced to take the required invaluable rest or holiday.

There are certain types of nervous people whose mental attitude towards their hypertension may be a constant source of worry to themselves. They should be reassured, that it is more or less common after certain age, and should look upon it as a handicap to which he must adapt himself notably with the aid of his doctor.

DIET.

For the stout. Those who are *stout and over weight,* satisfactory result may be obtained by *bringing their weight down,* permanently. Fat women at menopause are ably treated by a low dietary regime. *Fats and carbohydrates should be curtailed* to a minimum, the fluid and salt intake needs be limited. The patient should co-operate very sincerely with the doctor for this purpose.

But the majority of hypertensive subjects may be allowed an ordinary mixed diet, excepting those who show tendency towards retention of metabolic products of nitrogen. The greater part of the diet should be *made up of fresh fruits, vegetables, and carbohydrates, with ordinary, but small portions of meat and fish etc. Tea, coffee, smokes should be in great moderation,* preferably avoided. Total *fluid intake should not exceed about three pints a day.* Alcohol is unsuitable and should always be avoided. As a rule the meals should be small in bulk and evenly spaced. A full meal is conducive to sometimes avoidable accidents like cerebral haemorrhage. The food should have varieties, but be simple. Rich dishes are unsuitable. *Strict temperance* rather than abstinence from any particular article of diet is of

importance, and should always be adhered to. Klinefelter[8] (1936) showed that a diet of high caloric value, rich in meat, fat, salt and water had a tendency to raise the diastolic pressure in most cases, whereas a low caloric diet mostly of fruits and carbohydrates tended to lower it.

EXERCISE.

Some suitable form of *physical exercise is of considerable* use. This should naturally vary according to the tolerance of the individual. But however moderate, some form of physical exercise should be taken, specially by the stout, idle subjects, Walking, swimming, rowing, golf, etc. are suitable even for advanced cases, for the less severe ones, and those who can tolerate, moderate cycling, horse-riding, skating, tennis etc may be permissible. These not only promote physical fitness and circulatory efficiency *but are important measures* of relaxation, which is of much benefit for these hypertensives. *Deep breathing and forced expiration* have recently been found to be of good use in keeping the blood pressure low.

BOWELS.

Regular and satisfactory *evacuation* of bowel contents daily, is of help. Though some[9] doubt its usefulness. For this purpose, when the patient is seen for the first time, fractional doses of mercurial purges, such as colomel, or blue pill in half a grain, three to six such, taken at hourly intervals, in the evening, followed by saturated solution of magnesium sulphate one ounce, the following morning, are effective. For continued action and habitual use cascara, senna, aloes, jalap are suitable. For regular use, extract cascara sagrada liq in one to two drachms, twice or thrice daily, may be effective, in keeping the bowels open. The mineral aperients such as those from Vichy, Harrogate, Bath, Apenta etc may be used too.

In our country decoction of triphola—(Triphola-jol) and sugarcandy water with ispaghula are of use, and act as mild aperients. For this bael fruit, papaya, apples are of service too. For details chapter on constipation may be consulted.

8. Med. Record, (1936), 144: p. 446.
9. Alvarez, McCalla and Zimmermann, (1926), Arch. Int. Med. 38: p. 158.

Treatment in specially selected places is done in many countries. There are special sources of medicated mineral water, which is drunk by these patients in great quantities, and the effect is more preventive than curative.

DRUGS.

The number of drugs used are so numerous and varied, and their effects so inconstant that one can only mention some of the most well known and somewhat effective ones.

Injudicious use[10] of *hypotensive drugs is not justifiable* except where trouble is anticipated such as, threatened cerebral haemorrhage, anginal seizures, or cardiac asthma and similar troubles. Hypertension, though not beneficial, may be in certain cases inevitable, inorder to maintain an efficient circulation. When symptomless, high blood pressure should manily receive preventive and palliative treatment, and the dangers should always be guarded against.

Besides *purgatives and aperients* already discussed, a mixture, containing potassium iodide, in three to five grains with some form of bromide,[10] in ten grains is of use. When the patient is also constipated, we may give a prescription like the following.

Ammon bromide	gr.	10
Pot Iodide	gr.	4
Ext. Cascara sagrada liq	m.	60
Tr. Belladonna	m.	6
Syrup Orange	m.	60
Chloroform water	upto fl.	oz one

one dose twice or thrice daily, with hot milk to prevent iodism. This prescription is useful in cases of mild restlessness, or excitability, palpitation, flushing, tinnitus etc.

In cases where potassium iodide taken along with hot milk is not even tolerated, five drops of tincture iodine of the French codex may have to be given.

Insomnia etc. For *insomnia* with or without restlessness, prominal in one to three grains, luminal half a grain to one and a half grains, or more, theominal in five grains, may be administered. These hypnotics may also be given in addition to the sedative mixture containg iodide and bromide given above.

10. Grahm Stewart, (1929), Practitioner. May, p. 321.

In more severe forms of insomnia, twenty grains each of chloral hydrate and bromide may be of service. Some of the useful hypnotics are chloralamide in thirty grains or paraldehyde in orange juce, in one to four drachm doses. For temporary use, bromural, phenobarbital sodium in one to one and a half grains, after food, ortal one tablet at bed time, also may be allowed. In very intractable cases suitable doses of morphine and atropine may be required, commonly used are 1/100 to 1/200 gr. of atropine and one third to one fourth of a grain of morphine in combination. Phanodorm is liked by many.

Bismuth subnitrate, in ten to thirty grains, thrice daily, for prolonged period, is said to produce some nitrite like substance through bacterial activity in intestines with good result.

THYROID EXTRACT.

Thyroid extract in small doses say from half to two grains or more thrice daily may be of use for stout persons, notably stout women at menopause. But thyroid should not be exhibited to persons showing a quick pulse and thyrotoxicosis. Placental or ovarian or corpus luteum extract by injections or orally are also used, at times with effilacy, notably in hypertension at menopause etc.

Vasodilators.[11] When the morning headache is bad or the symptoms of hypertension prove troublesome, one tablet of *trinitrin* (*glyceryl trinitrate*) one hundred and twentieth of a grain, may be given orally to see if vasodilation controls the condition. If the symptoms are not relieved completely, the dose may be repeated in eight hours' time. For this purpose, *sodium nitrite* in one to two grains, or *erythrol* tetranirate (or *erythritylis tetranitras dilutus* B.P. 1932) in one grain doses increased generally up to two grains may be tried. These drugs are generally given every six to twelve hourly. There are numerous others advocated for this purpose. The few well-known amongst them such as anabolin, *liver extract,*[11] and *injections of acetyl-choline* are used, and the results are not uniform and the published results conflicting. *Pacyl,* a *choline compound* acts by stimulation of the

11. Althausen, Kerr and others, (1929), Jour Med. Sci. March, p. 398.

parasympathetic system, is given in one to two tablets thrice daily. The injectable *acetyl choline* should be given intravenously with great caution.

Sodium Sulphocyanate,[12] in two grains, thrice daily, after food, for one week, subsequently twice a day for two weeks or more, has been advocated with variable results. *Potassium thiocyanate* in two to three grains, three times a day for one month or longer may be of use. Though they appear to lower down the blood pressure in fair percentage of cases yet toxic symptoms like, flushing, urticaria are common. Personally, one on experience, is inclined to think that they tend to cause symptoms of poisoning rather easily. If there is suspicion of vascular spasm, depropanex injections may do good. Preparations of mistletoe are advocated. Orally acetyl-choline may do good.

Diuretics and vasodilators.

Calcium diuretin, or iodo-calcium diuretin, an improvement on the former, better still *rhodan calcium diuretin,* rhodan having been credited with hypotensive properties, one tablet three times a day, are worth trying, when oedema or hydraemia are coupled with hypertension.

CAUTION.

The vasodilators should be used with caution, as persons with hypertension are likely to have sclerosed damaged arteries and if any undue lowering of the blood pressure than to which the patient was used, is effected, thrombosis of the cerebral vessels may take place, with grave consequences.

Improvement of the digestive system.

This is of some use in many cases and is of much use in some cases. Carminatives after food, or gentian, nuxvomica, acid hydrochloric dilute, in suitable doses, and pepsin before or after food, may be of some use. Gas in the stomach and intestines, clinically constipation and indigestion appear to be conducive to hypertension, hence they should be avoided. Those showing symptoms of gout should be treated by colchicum, alkalies, purgatives and proper diet.

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12. Smith and Rudolf, (1928), Canad. Med. Assoc. Jour. Sept. p. 288.

Septic foci should be removed.

Subsequent stage or stages of failure.

There are three main sites of failure, the manifestations of which, we can trace clinically.

First of these, is not at all uncommon and, that is, the failure of the pipes, and this means that the cerebral vessels may show either thrombosis, or haemorrage, though by far the former accident is much more common than cerebral haemorrhage. This question will be dealt later on under cerebral vascular diseases.

The second is the failure of the filter, as shown in uraemic manifestations. These are cases of incompetence of the function of the kidneys and the organs may be secondarily contracted, either due to arteriolo-sclerosis or nephritis, nephrosis, or other conditions. The principal manifestations are either, to be found in uraemia, involving the gastro-intestinal system, such as vomiting, diarrhoea, or in respiratory dyspnoea etc. or in cerebral manifestations of convulsion, monoplegia, hemiplegia, coma etc. The treatment is discussed in the chapter on uraemia.

Thirdly comes the failure of the pump, either in the form of congestive type of failure, anginal attacks, or cardiac asthma etc.

For angina pectoris, vasodilators, such as inhalation of amyl nitrite for quick relief, and other vasodilators discussed above for subsequent use may do some good. Coronary dilators like euphyllin or other remedies dealt in acute cardio-circulatory disturbances, may be of use. Potassium iodide and bromide may be useful too. True angina is not so common in this country. Page[13] (1938) has shown how much resection of the anterior spinal nerve roots originally advocated by Adson and others[14] (1934) and severing of the splanchnics can do. Young subjects showing malignant hypertension appear to be benefited by these operations. Surgical treatment of hypertension appears to afford very promising results lately.[15] The operation consists mainly

13. Jour. Amer. Med. Assoc., (1938), April, 9th p. 1161.
14. Ibid (1934), April 7th. p. 1115.
15. Palmer (1947 May, 3) Jour. Am. Med. Assoc. 134: p. 9.

of thoracolumber sympathectomy, in a series of 100 cases[16] after careful follow up for one and a half to four years, the results were good in 47 percent, fair in 24 percent, unsatisfactory in 22 percent the operative mortality being 0.5 and case mortality 1 percent.

CHAPTER

RHEUMATIC CARDITIS

As rheumatic endocarditis, better carditis affects mainly younger[1] subjects the undermentioned lines of treatment ment for them may be modified according to the indication for an adult. The great French physician Lasegue said "Rheumatism[2] is a disease which licks the joints, the pleura and the meninges, but it bites the heart."

DIAGNOSIS.

Tonsillitis, growing pains, twitchings of chorea, are manifestations of rheumatic infection. Any unexplained pyrexia, associated with debility, or syndrome of carditis may be the only evidence of rheumatic infection. The diagnosis of well developed carditis is more or less an admission that the rheumatic invasion of the person has either not been controlled or recognised. If a careful pulse rate, temperature, and body weight are taken, they may serve as reliable guides as to the presence of a toxic state. A pulse rate of one hundred per minute at rest and ninty while sleeping with a temperature of 99.6°F. may be accepted as evidences of active infection. Slight leukocytosis, quick sedimentation rate of the erythrocytes are helpful points when the clinical findings are suspicious. The various valvular lesions generally develop in the process of recrudescences of rheumatic fever. A preliminary prolongation, roughening, want of clearness of the first sound at the mitral area[3] are highly suggestive of

16. Poppen and Lemmon. (1947 May 3) Ibid. 134; p. 1.
1. Wilkinson, (1935), Brit. Med. Jour. ii. p. 99.
2. Ritchie, (1935), Edin. Med. Jour. ii, p. 99.
3. Leary. (1932), Jour Amer. Med. Assoc. Jan. 13th p. 1-192.

valvulitis. But a soft, blowing murmur due to anaemia, toxaemia or simple dilatation of the ventricle has got to be differentiated. An aortic systolic is not so suggestive of acute endo-carditis as a mitral systolic murmur. Sedimentation rate of red blood cells, leukocyte count etc. are suggestive.

Rheumatic nodules[4] usually mean similar changes in the valves. Embolic phenomena are helpful diagnostically. If endocarditis supervenes on a subject of valvular disease, the murmurs are likely to be harsh. Electrocardiograms[5,6] may help to clarify the underlying physical damage to the heart.

TREATMENT

The principles underlying the treatment are in short :— (1) Relief of pain and distress by immediate and complete rest aided by suitable remedies. (2) Skiful feeding up. (3) To spare all avoidable strain on the heart, and to strengthen it. (4) To lead through the convalescence. (5) To prevent recurrences of rheumatic fever.

Rest in bed and relief of Pain. The patient should *be kept strictly to bed,* and all efforts should be spared. The pain is best relieved by application of ice-cap on the precordium. The bottom of the bag may be directly touching the precordium, the surrounding of the bag should be covered by cotton wool so that moisture collected on it may not soak the clothes. The ice should be well pounded, and should be replaced as soon as it melts away, but the bag not kept too long. Warmth may be preferred by many to cold application hence Kataplasma Kaolini may be useful.

If active arthritis is present, ten to thirty grains of *sodium salicylate* with double its amount of sodium bicarbonate are indicated, as outlined in the treatment of rheumatic fever. Bowels should be kept active by *saline aperients,* but bed pans should always be taken lying down, and no effort done. This period of absolute rest in bed should not be less than three months, gradual change, guided by reasonable test of cardiac response is safe.

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4. Debre and others, (1931). Presse. Med. Nov. 7th. p. 394.
5. Weiss, (1931), Amer. Jour. of Dis. Child. Dec. p. 1339.
6. Weiss, (1932), Jour. Amer. Med. Assoc. April 2nd. p. 1219.

Insomnia and restlessness. For this some preparation of *opium* may be used with advantage. A suitable combination is

Nepenthe	m.	4
Potassium bromide	gr.	10
Glycerine	m.	25
Chloroform water	upto fl. oz.	1

Two teaspoonfuls at bed time, or every six to eight hours for a child of six to eight years, may be of service.

Quinine salicylate in three to six grains may relieve cardiac pain. Neocinchophen in the above dosage may be used too. Sodium bicarbonate in double the quantity, per dose with above is always used for safety.

Collapse etc. should be treated in usual stimulant line for details see pages 143, under circulatory disturbances etc.

Stimulants. If the cardiac excitement is a prominent feature, with an unduly quick pulse, in the absence of pericardial effusion, small doses of *tincture digitalis,* say three minims of this and three grains of *sodium bromide,* with ten minims of glycerine in two drachms of chloroform water may be helful, for a patient of about six years given every six hours, till the pulse rate and cardiac excitement are reasonable.

In the case of failing strength of the heart, *liq strychnine* in two to three minims and tincture digitalis five minims may be exhibited to a young patient every four hourly till the symptoms are relieved. For other details see pages 196 etc.

Pericarditis. When, after an attack of pericarditis the heart though healed up is yet left feeble and dilated, *sodium formate* in small doses may be serviceable.

Sodium formate	gr.	3
Syrup zingiber	m.	30
Liquor strychnine hydrochlor	m.	1½
Peppermint water	upto fl. oz.	½

One dose every six hourly for a child of about ten years.

In the course of an acute attack of pericarditis, if restlessness, vomiting, lividity and pallor appear, the vomiting should be relieved as soon as possible. For this purpose anti-emetics, carminatives and stomachics are better indicated than *strychnine and digitalin.* For allaying of nausea and vomiting page 95 should be seen.

For other measures of symptomatic relief, the corresponding part of chapter on page 95 blackwater fever may be seen. All milk preparations may have to be predigested, or peptonised. Essense of chicken, or thin vegetable soups with lemon juice and salt according to taste may be liked. Slightly acid fruit juices may be enjoyed by the patient, either with salt or sugar in the form of cold drinks. If inspite of these measures the vomiting persists, one should stop all feeds orally, and rectal saline with five percent glucose may have to be administered every four hourly in three to four ounces by Murphy's drip-method, to combat the loss of alkali reserve, dehydration, and inanition.

Symptomatic. For cyanosis, continuous oxygen inhalation, for restlessness, bromides and nepenthe as suggested already, *brandy* for collapse, *leeches for pericarditis*, pain and engorged right heart, may be effective. In congestive cardiac failure leeching the liver region should be followed by cardiac stimulants, like digitalis etc.

PARACENTESIS.

When the pericardial effusion is large as indicated by diffused and wavy or absent cardiac impulse, distant apical sound having a muffled character, wooden but pear shaped area of dullness, typical radiographic appearance, paracentesis should be done by introducing a stout needle at the extreme outer limit of cardiac dullness in the left axilla just beyond the region of the apex. A preliminary local anaesthesia by two percent solution of novocain, in two to four c.cm. or more may render the operation quite painless. Very often the needle will be blocked by flakes of lymph, requiring passage of the stilette. In bad cases proving intractable to aspiration, the help of a skilled surgeon may be indispensable.

Convalescence. This should be about for a period of six months in all genuine cases of rheumatic carditis. Whole of this period should not, however, be spent in passive rest but utilised in cautious preparation for the heart to return to the strain of daily occupational life. The response to effort, as judged by the rise of pulse rate, first to propped up posture, and the time taken to come to normal after effort, the body temperature, response of the heart to exercise, all help to regulate the nature, speed, and method of change of posture from the recumbent state to a standing one. To speed up the convalescence reasonably, the details are considered under the heading of;

(1) *Rest, fresh air and sunlight.*

To allow young patients to take up ordinary life after prolonged periods of rest in bed without preliminary preparation appears to be a mistake. But prolonged rest is the most useful item in treatment.

The boy should have plenty of sunshine, fresh air, iron, arsenic and vitaminous tonics, such as ferradol, syrup minadex, navitol malt compound etc., codliver oil, eggs, butter, milk, fruits should be given liberally. If the appetite is poor an alkaline bitter mixture or an acid bitter mixture with a purgative may be of use. For the details the chapter on dyspepsia may be consulted.

Though we cannot control the cardiac lesions to any appreciable extent, except to restrict and cutshort their ravages, yet by prolonged judicious periods of rest coupled with peace of the mind, and graduated types of exercise, and prevention of relapse of rheumatic fever, the mother disease, may do a good deal to prevent a ruinous life with a badly damaged or decompensated heart. The question of having separate colonies[7] for patients having damaged hearts is being discussed. For the treatment of *other forms of endocarditis* see page 57 under penicillin therapy.

CHAPTER

RIGHT SIDED CARDIAC FAILURE

DIAGNOSIS ETC.

Generally there may be some causal factor acting adversely to efficient action of the myocardium. The valvular defects not only create mechanical disadvantage against which the myocardium acts, but also produce changes in the cardiac musculature, aorta or the coronary arteries. There may be any of the following causative factors at work (1) Rheumatic, (2) Syphilitic, (3) Arteriosclerotic, (4) Degenerative, (5) Hypertensive, (6) Infective and toxic, including thyrotoxicosis etc., (7) Miscellaneous etc. (8) Congenital etc. But it should be understood, that the functional efficiency of the heart depends on the myocardial integrity.

7. Benjamin, (1932) N. York State. Jour. of Med. March 15: p. 325.

Heart failure.[1] Numerous theories and explanations have come and gone, as to the physical basis of heart failure. The back pressure theory was first formulated by Hope (1832). That myocardium was the main item in heart failure was stresed by Stokes (1854).

Mitral stenosis shows more diminished vital capacity as compared with aortic disease, in it there is back-pressure and stasis in the pulmonary circuit. In left heart failure or in aortic disease the symptoms are due to congestion in the lesser circuit with varying degree of oedema there.

Chronic cough, emphysema also affect the right heart, leading to congestive failure, called "Cor pulmonale."

Symptoms. These are varied and so numerous that only the more important ones are mentioned.

Alimentary. Loss of appetite, indigestion, feeling of detension, vomiting, flatulence, pain in the abdomen, meteorism, constipation, hemorrhoids, enlargement of the liver are common, ascites of a variable degree develops later on.

Respiratory. Hyperpnoea, dyspnoea, orthopnoea, cardiac asthma, cough, haemoptysis, pain, Cheyne-stokes respiration cyanosis, noticed at the finger tips, lips, tip of the nose etc. Hoarseness of voice.[2] There may be congestion at the bases of the lungs. Hydrothorax is a rather late symptom.

Nervous. Headache, sleeplessness, disturbed brain activity, night starts, fainting attacks, mania, Stokes-Adams syndrome, drowsiness, later in the course of the disease, usually with a fatal issue, come unconsciousness, stupor and coma.

Oedema is at first noticed on the ankles, gradually spreads all over the body, and there may be anasarca.

Renal Condition. The total output of urine is considerably diminished, it is darker in colour, and is of higher specific gravity, urates and uric acid are increased. Small amount of albumin and casts are common.

Cardiovascular System. There may be palpitation, breathlessness on slight exertion, the position of the apex of the heart is variable, but generally outside the normal limit even beyond the nipple line. There may be a sense of pain[3]

1. Gibson, (1938), Medical Annual, p. 240.
2. King, Hitzig and others, (1934), Amer. Jour. Med. Sci. 188 : p. 691.
3. Smith, (1929), Lancet, i, p. 1080.

on the chest or fullness in the precordium. The neck veins become prominent and stand out. There may be precordial distress and anginoid pains. Breathlessness, cyanosis, dyspnoea, engorgement of veins, enlarged liver, and others are generally the symptoms of mitral valve disease, whereas precordial pain, fainting attacks, night starts, are the commoner manifestations of aortic valve disease.

There may be all signs and symptoms of associated *auricular fibrillation*, where no two beats are alike, blood-pressure varies from beat to beat, rate of pulse is higher coupled with failure symptoms.

Blood pressure is variable and depends generally on the underlying causative factor. Radiogram,[4] electro-cardiogram may supply important data as to the size of the heart[5] and the state of myocardium. Oedema of the bases of the lungs may be well seen in a skiagram.

TREATMENT

Rest.[6] This constitutes the most important item in the treatment. Rest should be *mental as well as physical.* In most of the advanced cases the patient has got to be propped up supported by a number of pillows on the back. A back-rest is of good service. All efforts should be spared, turning in bed, feeding, answering to nature's calls, all should be assisted by sensible attendants, where nurses can not be afforded. The visitors should be disallowed in serious cases. Conversations are often exhausting. *Worries and anxieties should be kept back from the patient. The room should be quiet, cool and well ventilated.*

Posture. The patient should be *propped up* with a large number of pillows on his back, and the support should be uniform from top to bottom. The common error of only supporting the head and neck, leaving the back unsupported should always be avoided. Air cushions for the buttocks may be of use. A pillow supporting the slightly folded knees may help in maintaining this propped up position. When the patient is very orthopneic some support kept in front of

4. Parkinson, (1936), Lancet, i, p. 1337.
5. Kurtz and White, (1929), Amer. Jour. Med. Sci. August. p. 181.
6. Wood and Wolferth, (1937), Ibid. 193 : p. 354.

the patient's bed on which he can lean forward, is of much use. For his purpose, the heart tables used in the hospitals, may be utilised with advantage.

Diet. In severe cases only sips of glucose water not exceeding a *total* of about *twenty ounces a day* should be given. One can prepare glucose lemonade by dissolving in one pint of water one fourth of a pound of glucose having two lemons sliced in it. Fruit juice, aerated waters, cold water in sips, may be liked by the patient. Even when the patient improves, not more than thirty to fifty ounces of fluids should be given. For younger subjects and those who like, barley sugar, may be sucked. Weak tea may be allowed but not coffee. Those who are used to *alcohol*, may take whisky or brandy or gin and not fermented liquors. Two to three ounces may be allowed per day.

When the patient is better, a simple and nourishing dry diet in small quantities, but at frequent intervals is of service. For this purpose thin bread, toast, butter and jelly, egg on toast, small portions of live fish boiled or fried, eggs poached, fried etc. are suitable. Meat in small portions when the patient's digestion has improved is enjoyed by him. For Indian diet, fried rice and paddy, (Khoi and Muri), boiled rice, with simple curries of spinach, fish, meat and eggs, or khichuri according to liking, taste and digestion, but in small portions and at frequent, say, every three to four hourly, and preparations of milk casein, lentils etc. may be given on the above principles. The vitamins must be given adequately.

Salt. As the sodium ion tends to perpetuate oedema, it should be withheld, specially in markedly oedematous cases. Common salt, sodium bicarbonate, sodium citrate by retention of the sodium ion tend to increase the oedema, hence should be withheld. The cooking should be done without salt, and *titro dietetic* salt may be added afterwards either while taking the food or subsequent to cooking. *Potassium chloride* and lemon juice or a little vinegar may add to the taste of the diet. *Fluids and salts should be withdrawn*, as much as possible. Selarom contains sodium ion hence is not of much use.

Acute congestive cardiac incompetence.

Due to dilation of the auricle there may be auricular fibrillation but rarely there may be auricular flutter too, with paroxysmal tachycardia. Auricular fibrillation is very effectively treated by therapeutic doses of *digitalis*.

As regards the choice and dose of preparations of digitalis, it is very difficult to single out one from the other. Specially for auricular fibrillation *digoxin* is of service. One mg. to 1.25 mg.[7] about one sixty-fourth of a grain by mouth, causes ventricular slowing in about an hour to show its maximum effect in seven hours' time. But in serious and advanced cases absorption from the gut being deficient due to congestion and oedema *intravenous digoxin*[8] therapy, in one hundreth to one sixty-fourth of a grain dose, *with glucose*, starts slowing the heart in about ten minutes and the maximum effect is reached in two hours' time. But intravenous digoxin is *contraindicated*[9] if the patient has received digitalis even within two weeks. Being a bad tissue irritant if any fraction of this preparation leaks outside the vein during intravenous injection, a severe irritation results. These digoxin injections per vein should be given very slowly taking about three to five minutes[10] over it. A solution, having 80 percent alcohol, is available in rubber capped phials, each c.cm. containing half a milligram of digoxin. For intravenous use, one c.cm. is to be diluted to ten c.cm. with glucose.

The *B. P. tinctures* are quite effective, when they are freshly prepared and are given in adequate dosage. If the ventricular rate is one hundred and forty or more and the patient already not under treatment with digitalis, the drug may be given by massive dose method. An adult of about one and a half maunds or near about one hundred and thirty pounds, should get about 1.25 mg. or about 1/50th of a grain of digoxin or about two drachms of the freshly prepared tincture orally. For persons of lesser weight, say for a person weighing about one hundred pounds 1.0 mg. of digoxin or one and a half drachms of a freshly prepared tincture may generally be sufficient to initiate improvement. After this about 0.25mg. of digoxin or about thirty minims of the tincture should be prescribed till the ventricular rate falls nearabout seventy per minute. *Generally an average adult*

7. Gold (1946 Nov. 9), Jour. Am. Med. Assoc. 132: p. 549.
8. Rykert and Hepburn, (1936), Canad. Med. Assoc. Jour. 34 : p. 281.
9. Wayne, (1931), Clin. Sci. i, p. 63.
10. Beumont and Dodds, (1936). Recent advances in medicine. p. 268. J. A. Churchill 8th Edition, 1936.

excretes about twenty to twenty three minims of tincture digitalis per day, hence the importance of keeping on a maintenance dose, above or near about this dosage daily.

There are many other forms of digitalis preparation which are also effective. *Strophanthin* in one hundredth to two hundredth of a grain with glucose, given slowly per vein, is also useful, provided no previous digitalis therapy has been undergone within the last few days. *Strophanthon* (P.D.) given intramuscularly in one c.cm. is also of use for action.[11] Once the urgency is met by injections, one is justified in exhibiting these groups of drugs orally. Injection of strophanthin is of special use in cases where orally digitalis is not very effective or is not tolerated.

Nativelle's Granules of Digitaline. They are sold generally in 1/240 to 1/600 gr. granules. One granule of 1/600 gr. is equivalent approximately to fifteen to twenty minims of the tincture. This preparation has the special advantage that it is well tolerated by persons, who cannot tolerate other digitalis group of drugs orally. They have proved effective also in cases refractory to tincture medication. There are numerous other preparations of this remedy.

Bigger doses than those advocated above may be required in bad resisting patients and the dosage should always be therapeutically effective.

Improvement.

Generally the beneficial effect of digitalis medication is demonstrated not only by *slowing of the pulse rate* and a general all round improvement of the patient, but also by the starting of the usual *critical diuresis.* This is a signal proof of the therapeutic value of the drug. The scanty micturition becomes copious and the oedema begins to clear up easily and rapidly. Unless diuresis starts, probably, digitalis is not going to do much good in that particular case. Digitalis is also useful in slow rate but with right sided failure—the results may not be so spectacular.

When to stop medication. Digitalis group of drugs should be stopped as soon as the pulse rate comes nearabout *sixty to seventy per minute.* The most important danger signal is in coupling of heart beat, in this condition there are two beats one following the other in quick succession, then

11. Bedford, Campbell and Wood, (1935). Guy's Hosp. Rep. 85 : p. 185.

comes a pause, again another couple of beats and so on. If inspite of slowing of the heart and coupling of beats digitalis is continued, ventricular fibrillation and even sudden death may follow. Nausea, vomiting, extra systoles, heart block, irregularity of the hitherto regular pulse, all should be seriously considered from the stand point of discontinuing the drug.

Once the pulse is slowed down, maintenance dose should be so regulated that the rate of the ventricular beat as determined by ausculation etc. remain between seventy to eighty per minute. Though the amount of the drug required for this purpose varies from person to person, yet generally 1/250 gr. of digoxin once or twice a day, or about ten to fifteen drops of the tincture thrice a day, orally may be enough to keep up the desired therapeutic action on the heart. *But once there was failure, the patient usually will require some form of digitalis therapy for the rest of his life.*

Quinidine. It was first used systematically by Frey[12] (1918) for auricular fibrillation. Wenckebach[13] (1914) used in one case of auricular fibrillation with good result. It acts by depressing conductivity of the bundle.

Selection of cases. Quinidine is of special use in cases of auricular fibrillation notably without enlargement or valvular disease of the heart. Disease of recent or sudden origin give better results than old degenerative cases. It is also useful in paroxysmal tachycardia due to auricular fibrillation or flutter. It seems to have very little effect on ectopic contractions. Carter and Trau[14] (1935) found quinidine and strychnine in 5 gr. and 1/30 gr. respectively, combined, useful for uncomplicated extrasystoles.

Contraindications. This drug should on no account be exhibited when the signs and symtoms of failure are still there. Once the compensation is restored by rest, digitalis, diuretics, coronary dilators, and after a week's rest during which period no digitalis is exhibited, this drug may advisably be given. Heart block is a contraindication. Sometimes embolic phenomena may result, due to co-ordinated contraction under quinidine of the so long fibrillating auricles, containing thrombi in them. It is injudicious and inadvisable to administer quinidine and digitalis simultaneously.

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12. Frey, (1918), Berl. Klin. Woch, 15 : p. 417-450; 849.
13. Wenckebach, (1914). Die unregelmassige, Hertzatigkeit etc., 1914; p. 125.
14. Amer. Jour. Med. Sci., (1935), 189 : p. 206.

Methods of administration.

The patient should be in absolute rest in bed all the time. Diet and bowel movement should be regulated. Straining at stool, under quinidine therapy, may lead to easy dislodgement of auricular thrombi and by blocking a cerebral vessel serious neurological manifestations may follow.

Preferably given in capsules, in doses of one to three grains, to test if any idiosyncrasy to the drug is present. If no untoward symptom is manifest, four to six grains may be given every three to six hours. This is continued for a week and if this does not restore the normal rhythm, in all probablity, it won't be effective. Before each dose the pulse should be examined for a normal rhythm, and once it is established no more of the remedy is needed, at least temporarily.

Contraindication is idiosyncrasy. In susceptibles quinidine may cause respiratory failure and cerebral paralysis. Embolic phenomena due to detachment of clot formed in the auricle may not necessarily be fatal. Ventricular fibrillation may cause sudden death.

Value of the Drug. This is doubted by many. There are definite contraindications to the use of this remedy. The cases should be carefully chosen and watched. The rhythm might be normal, but the underlying myocardial damage which is the main cause of the failure often remains unaltered.

Venesection, Oxygen etc. If there is much engorgement of the veins in the neck, together with a tender enlarged liver, risk of oedema of lungs, venesection or leeching will give relief. By tying a rubber tubing on the upper-most part of the upper arm, a stout needle may be used to bleed from the ante-cubital veins. The stout conical needle devised by Herbert French, available from Messrs Down brothers is suitable. French's blood-letting exhaust bottle, available in the above firm may be of service for those who require frequent use of it. *About eight to sixteen ounces of blood when with drawn, and glucose strophanthin or digoxin diluted nine times its volume with glucose solution, given slowly intravenously, good result is derived quickly.*

Leeching. The old method of applying about four to ten leeches on the liver region is an effective way of dealing with this passive congestion. It is better, in several ways

than the bleeding done from the veins. For their easy application, the big leeches are taken, one at a time in a test tube or some such container, a swab dipped in milk is touched on that part of the liver area on the upper abdomen previously cleaned by rectified spirit, where one wants it to be attached. If the test-tube is inverted over the area touched with milk, the leech is likely to get stuck on the point. About four to eight leeches are generally sufficinet for an average case. When they are fully fed and satisfied they will drop down of themselves.

Generally no effort should be made to arrest the bleeding following application of leeches. The bleeding points stop automatically after some time. Tincture benzoin compound used for sealing the punctures is generally enough. To prevent the sticking of the other end of the leeches, on the skin, a piece of lint or stout linen is placed on the abdomen, stretching below and around the punctured points.

Advantages of leeching. Clinically the patient has been found to derive, greater relief from leeching than from bleeding, the latter method is often resented to by the relatives of the patient or by the patient himself. The novelty of leeching is sometimes impressive to the patient. Each big leech takes about two to three drachms of blood, but the subsequent oozing is of real service.

Oxygen. This should be given through a nasal catheter, specially when marked dyspnoea is present. Richards and Barach[15] (1934) estimated the following to be the most important signs and symptoms in order of their importance requiring brisk oxygen therapy. 1. Dyspnoea, and Cheyne-stokes respiration. 2. Restlessness. 3. Cardiac pain. 4. Cyanosis. Cyanosis according to them is a poor criterion of the degree of oxygen need, as it may be deep with a normal arterial saturation. It is preferable to push the catheter through the nose right into the back upto nasopharynx and the rate of liberation of the gas should be about two liters per minute. The funnel method of making the patient inhale oxygen appears more or less useless. It is better still if the oxygen is allowed first to bubble through warm alcohol kept in an air tight bottle and then to pass to the patient's nostrils. The catheter is as a rule irritating and the patient often pulls it out. To prevent this if one per cent pantocain ointment is smeared on the catheter and then pushed into the nose, the pantocain causes anaesthesia locally and the patient does not feel the irritation so much and does not

15. Quart. Jour. Med., (1934), 27 : p. 437.

at all pull out the catheter, even if he does it, not so frequently as he would have done otherwise. The proximal end of the catheter is conveniently secured on the forehead or cheek of the patient by a band of adhesive plaster. It is no use giving oxygen intermittently but should be given continuously. The ideal is to give oxygen by a tent.

Glucose. Glucose solution, in twenty five or fifty per cent strength, given in twenty five or fifty c.cm. intravenously every eight or twelve hoursly is very effective not only as a tonic for the myocardium, but also the pain over the precordium, and other symptoms of functional incompetence of the heart often show, not uncommonly, remarkable improvement. Along with strophanthin, or digoxin, glucose solution is a very effective therapy. Podolsky[16] (1935) gives five to thirty percent solution of dextrose in five to twenty c.cm. per kilo of body weight, with good results.

Some cardiac stimulants.

Camphor group of drugs. Camphor in two to four grains dissolved either in olive oil or ether is a prompt stimulant for the heart. *Cardiazol* alone or *cardiazol ephedrine,* in one c.cm., by injection or bigger or the same dose orally may be given. Cardiazol-ephedrine has got the advantage of the additional, anti-spasmodic and coronary dilating action of ephedrine added to the heart stimulant action of cardiazol. Where the slight depressing action of quinine on the conductivity of the bundle is required, cardiazol-chinin may be tried. But this group of drugs (cardiazol) is not of any great use. Recently *solucamphre* given intraveneously, had resuscitated an apparently hopeless case of collapse where most other drugs appeared futile. Cardiazol, coramine, cycliton all nikethamides, are recent stimulants of the cardio-respiratory system. Nikethamide is useful.

Caffeine sodium salicylate. This group has the cardiac stimulant property fortified by the diuretic and coronary dilating effect of caffeine. But as the latter tends to cause insomnia by stimulation of the cerebral psychical areas, they should be given cautiously, where sleep is an important recuperating necessity. It is generally given in two to ten grains subcutaneously or intra-muscularly, and repeated every six to eight hourly.

Strychnine, appears to have very little demonstrable effect in cardiac failure.

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16. Jour. Amer. Med. Assoc., (1935), Abstract, 104: p. 1672.

Atropine. Where the congestion of the lungs is very great atropine may have to be given in 1/100 to 1/50 gr. subcutaneously and may have to be repeated every six to twelve hours. Combined with half a c.cm. of fresh adrenalin (1 :1000), atropine 1/50 gr. is useful in pulmonary oedema.

Coronary dilators, like theophylline,[17] euphyllin, adrenalin, ephedrine, lacarnol, caffeine sodii salicylas etc., all have got to be used according to indication, specially in those cases where coronary supply is considered to be defective,[18] or in precordial pain not relieved by ordinary means of glucose or oxygen etc.

Coramine (Ciba) cycliton, etc. are good cardio-respiratory stimulants and have been used in pnuemonia, drowning etc., with good result. They may be given orally as well as by injection.

Obstinate dropsy. Inspite of acute symptoms of heart failure having disappeared, under adequate doses cf digitalis, the oedema may not pass off. A large hydrothrox or ascites may require tapping. The compound digitalis pill, containing one grain each of pilula hydrargyri, digitalis folia, pulv scilla, is given three times a day. The squill is almost inactive, and the dose of digitalis inadequate. Hence a better preparation, consists of pilula hydrargyri one grain and digitalis folia two grains, thrice daily, may be used with success in these cases of oedema. But the hydrarg has, when used long, the peculiar disadvantage of causing trouble to the teeth and gum, specially when they are already bad.

As useful diuretics in cardiac incompetence next to digitalis group are the mercurial derivatives, such as salyrgan, novurit, neptal, esidrone etc. Neptal has a recent improved form and is of special use.

They are given intramuscularly into the buttock in 0.5 c.cm. initially as a test dose, *preceded by ammon chloride,* to render the urine highly acid, because salyrgan is effective in acid urine. For details of this the chapter on ascites due to cirrhosis of liver on page 471 may be consulted. The amount of urine passed may even reach upto two thousand c.cm. or more daily. This diuretic is all the more useful in

17. Friedman, Resnik and others, (1935), Arch. of Internal. Med. 56 : p. 341.
18. Resnik, Friedman and Harrison, (1935), Ibid. p. 1087.

all oedematous states, as it helps in the excretion of big amounts of sodium chloride out of the system. The latter is an important agent in maintaining the oedema.[19]

Novurit is a recent diuretic of the mercurial group and is effective when given rectally as a suppository. It may also be injected with good result.

Diuretin. Diuretin may prove very effective for this purpose.

In some cases of oedema with hypertension proving refractory to digitalis and other diuretics may yield to big doses of potassium citrate, say in one drachm thrice or four times a day. Sodium ions are withheld as much as possible during treatment by potassium citrate.

The heels etc. The heels, the penis and scrotum in bad cases may be so much oedematous that they may require special care. The heels should be placed on pads of cotton wool, the penis and scrotum should be raised up well supported instead of allowing them to drop and hang down as usual.

Some special symptoms.

Insomnia. Peaceful sleep even if it is for a few hours, gives much relief to these sleepless patients of congestive cardiac failure. The safest drug is *paraldehyde*. If given orally it should be in one to two drachms either in a cachet, or mixed with syrup lemon or orange, and a few drops of oil lemon. Rectally three to six drachms of it, very well shaken with four ounces of warm saline, high up, may be quite effective. About one dram of paraldehyde in half an ounce of gin may be effective on those who are used to alcohol. It may be injected intramuscularly in 5 to 10 c.c. doses.

For milder cases of insomnia a combination of bromides and chloral hydrate ten to twenty grains each with one drachm of syrup zingiberis and aqua upto an ounce, may be quite useful. Hypnotics of the *barbiturate group* are not so satisfactory in this condition as they may cause mental confusion. If *chloral and bromide* are not tolerated orally and cause vomiting or nausea, then rectally they may be given in half a drachm each in six ounces of warm normal saline, high up by the Murphy's drip method. *Medinal* in three to

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19. Pool and Stern, (1936). Arch. of Internal. Med. 58: p. 1087.

six grains crushed, and taken with hot water may be effective. It acts very rapidly. *Ortal* one tablet, is sometimes useful. *Morphine*, though quite effective and safe in left ventricular failure, is not the hypnotic of choice, in congestive type of cardiac incompetence. In the presence of pain, such as in pulmonary infarction, *morphine* in small doses say in 1/6 to 1/8 gr. with *atropine* 2/200 gr. may be used. These small doses of morphine when supplemented by comparatively smaller amounts of chloral hydrate and bromide may induce peaceful sleep. For restless or maniacal patients who refuse paraldehyde, may be given half a grain of omnopon combined with one hundredth of a grain of scopolamine hypodermically. Morphine group should preferably be withheld in cases suspected to have oedema of lungs.

Cough. This is generally due to congestion of the lungs and the only effecive treatment consists in relieving the congestion, for details see pages 143, 180 respectively.

Regulation of Bowels. Concentrated saline purges are useful by keeping the stools liquid and relieving the portal congestion. One to two drachms of saturated solution of magnesium sulphate in an ounce of warm water early in the morning is effective for this purpose. If there is vomiting, half to one ounce of magnesium sulphate in a pint of warm water given rectally as an enema, may relieve the constipation. *Diarrhoea* when trouble-some associated with vomiting the question of uraemia should be remembered and the urine, and blood examined to negative this condition. Diarrhoea may have to be treated by bismuth, or tincture opii, or tannalbin etc.

Pain. Pain in congestive failure may be due to pulmonary or splenic infarction. In pulmonary infarction, pain, haemoptysis, friction sound may be present. Pain in the region of the spleen suggest splenic infarct. Counter irritants in the form of strong liniments, dry cupping, or causing of blisters may give much relief. Pain of hepatic congestion generally yields to venesection or leeching and effective digitalis therapy. But in intractable cases morphine and atropine may be the last resort. Eukodal, dilaudid are all derivatives of morphine, and may be used in suitable cases with caution.

Thyroidectomy. Recently the thyroid gland is being partly removed with variable success in cases of congestive cardiac failure.[20] The recent literature on this question is too voluminous, and many workers report subsequent subthyroidism following these operations.[21]

The question of employment of patients with heart disease is discussed by Stroud[22] (1935).

Gall-bladder and heart disease. Fitz Hugh and Wolferth[23] (1935) showed that there is a relation between the pathological states of the gall-bladder and the heart. When diseased bile reserviors, giving rise to heart troubles like alteration of rhythm or myocardial dysfunction, were removed successfully, the heart condition was favourably influenced. This clinical fact when remembered many cases of apparently intractable cardiopathies would be more or less successfully remedied with the cure of the diseased gall bladder.

Pregnancy and heart disease. Hamilton and Kellog[24] (1928) are of opinion that patients who have had heart failure, auricular fibrillation or hypertension do not stand pregnancy well, and acute rheumatic fever contra-indicates pregnancy for at least a year after restoration to health.

COMMONER DISEASES OF THE BLOOD AND BLOOD FORMING ORGANS

CHAPTER LXXVII

ANAEMIAS

There are numerous *classifications* one of Ottenberg in[1] 1933 is comprehensive.

SECONDARY ANAEMIA

(Hypochromic microcytic anaemia)

DIAGNOSIS ETC.

General. There may be not only diminution of the number of red blood corpuscles, oligocythaemia, but also

20. Eggleston and Weiss, (1935), Amer. Jour. Med. Sci. 189 : p. 727.
21. Bremner and others, (1934), Brit. Med. Jour. ii. p. 624.
22. Jour. Amer. Med. Assoc., (1935), 105 : p. 1401.
23. Ann. of Surg. (1935), 101, p. 478.
24. Jour. Amer. Med. Assoc., (1928), Dec. 22. p. 1942.
1. Jour. Amer. Med. Assoc., (1933), April 29th p. 1303.

diminution in the haemoglobin content of the blood, oligochromaemia. In secondary anaemia the haemoglobin is usually reduced to a greater degree than the number of red blood corpuscles, their sizes are smaller, and the colour index is below unity, hence termed *hypochromic microcytic anaemia*, whereas in primary anaemia the red blood corpuscles are usually larger in size than average, with various alterations in shape and size, (poikylocytosis and anisocytosis) and proportional increase of haemoglobin per corpuscle, hence the colour index is always above one and hence is termed *hyperchromic macrocytic anaemia*.

When the demand is very great, regeneration from the bone-morrows cannot keep space with the loss, and the result is, appearance of immature red blood corpuscles or nucleated red cells in moderately bad cases, but in very severe states of anaemia the megaloblasts which are bone-marrow cells, are hurried to the circulation, and their presence always indicates too severe a loss or destruction along with which the regenerative processes cannot cope.

The commoner cases of secondary anaemia in our country are, (1) infections including malaria etc., (2) bleeding piles, (3) helminthic anaemia, (4) nutritional anaemia, (5) recurrent bleeding from gastroduodenal ulcers, cirrhosis liver, epistaxis, menstruation in women etc.

As regards signs and symptoms and regeneration of blood *after a severe haemorrhage* MacCallum's pathology gives a good account.

Symptoms in short are :—

Cutaneous system. *Pallor*, waxy or deadened hue, the mucous surfaces, conjunctival mucous membrane of the lower eye-lid, all look pale and not uncommonly shiny, there may be oedema starting from the inferior extremeties, general anasarca may be present too.

Cardiovascular symptoms. The heart may be dilated, breathlessness, even without much exertion, dyspnoea, tachycardia, arrhythmia, syncopal attacks etc. Haemic murmurs in the heart, are most common in the pulmonary and mitral areas.

Nervous system. Drowsiness, vertigo, extreme irritability, restlessness, insomnia, night starts, mental depression, headache, etc. are common amongst signs and symptoms of the nervous system.

Gastro-intestinal, manifestations usually are, achlorhydria, anorexia, nausea, perverted or excessive appetite flatulent dyspepsia, etc etc.

Though the sub-cutaneous fat may remain intact, yet the patient is pale and suffers from the signs and symptoms named above.

These anaemic persons with lowered resistance are very liable to be victims to all sorts of infections, which may prove fatal, hence they should be kept very carefully and infected persons or carriers who may transmit any infection should not be allowed to come near these subjects.

TREATMENT

The principles involved are :—

(1) Removal of the cause, (2) to improve the regenerative capacity of the blood forming organs. To achieve these purposes the treatment may be subdivided under several heads.

General measures. In severe haemorrhage, or in grave states the patient should be re-assured that he is going to get better. Give him physical rest, mental quietness. In severe cases, the patient should be kept confined to bed. Fresh air and sunshine reasonably given may be of service. A dry, bracing climate hastens recovery. As these subjects have lowered resistance and are prone to get chilled easily, they should wear reasonable clothing and coverings. High altitudes have a stimulating action on the bone-marrow. Judiciously applied friction and massage may be of some relief to these anaemic persons confined to bed. As the patient gradually improves, very well regulated graduated exercise, such as gentle walking, or golfing may be allowed but always short of fatigue. In all grave cases of anaemia cardiovascular instability is not uncommon, hence all the more reason that physical exercise should be undertaken very carefully and with considerable judgment.

CONSTIPATION.

These patients are as a rule constipated. For this purpose, fruits, green vegetables rich in iron not only help to improve the blood condition but also act as laxatives. Whole-meal bread, or bran-bread may be of use. Simple decoction of triphola or senna leaves may be an effective, inexpensive house-hold remedy for constipation. For further methods of treatment, the chapter on constipation should be consulted.

Nervous Irritability and insomia. For these *bromides*, in ten to twenty grains twice daily, or other hypnotics like, luminal, dial, both in half to one and a half gr. doses, ipral calcium in same dosage may be of service.

Diet etc. Diet[2] should consist of easily digestible iron rich and nutritious articles. Green leafy vegetables, eggs, meat, fish, soups, liver-fried or soup of chopped liver, may be given for those who take meat etc. For vegetarians, the leafy vegetables, green peas, spinach, green bananas, green jack-fruits, figs, *patols, jhinga* and other green vegetables are good and some of them being rich in chlorophyl and iron, are specially suitable. For the nourishment milk and its preparations may have to be depended on and it should be realised that milk is very poor in iron. It is always better that small meals should be partaken of by these patients at comparatively shorter intervals, as these do not throw any strain on the digestive system, with some achlorhydria, but help and promote assimilation. Purely vegetarian diet appear to produce more macrocytic anaemia, probably due to lack of extrinsic factor of diet.

Such purin rich animal diet as liver, kidneys, etc. should preferably be added to the diet gradually. Live fishes like koi, magur or singhi are good for these persons, specially when made into a curry with green bananas and leafy vegetables, both of which are rich in substances which improve the blood condition.

Medicines. The following lines quoted from various works, prove that the numerous anti-anaemic remedies whose active constituent is organic iron, such as haemoglobin are far inferior to cheap inorganic iron salts.[3] Whipple[4] (1934) in his Nobel prize lecture, also emphasised this point. "Haemoglobin fed by mouth is poorly digested and we observe only about ten to fifteen percent recovery as new formed haemoglobin."[5] Witts (1936) has reminded us that a mild acidity of the duodenum is important for the absorption of iron present either in the food or medicines,

2. Widdowson and McCance, (1936), Jour. of Hygiene. 36 : p. 13.
3. McCance and Widdowson, (1937), Lancet, ii. p. 680.
4. Whipple, (1934), Nobel prize lecture 12th Dec. 1934. Published in Jour. Amer. Med. Assoc. 9th March, 1935, p. 791.
5. Medical annual, (1933), p. 33.

and it is also a fact that in cases of anaemia if dilute hydrochloric acid is given orally after meals, then the hitherto unabsorbed food iron gets absorbed and even without exhibition of extra iron, the patient improves in blood condition. Hence in all cases of anaemia where hydrochloric acid secretion is likely to be deficient, better result follows when iron and hydrochloric acid are combined than when either is exhibited alone.[6] It is also a fact that better the haemoglobin content of a person's blood the better is his hydrochloric acid secretion, hence in anaemia deficient hydrochloric acid in the gastric juice helps in maintaining the vicious circle. If one link in the chain is broken the circle is undone and the patient improves.

Iron. According to Witts, ferrous chloride in three grains is as effective an anti-anaemic as any other iron salt. Ferri et ammonii citras in twenty to sixty grs. thrice daily may be of good use. It is said that ferri et ammonii citratis is so effective because of traces of copper in it as impurity. However while giving a prescription for simple hypochromic anaemia, one should preferably give a mild purgative, and other catalysts like traces of copper and manganese etc. Any one of the following prescriptions is good enough.

Ferrous chloride	gr. 3
Acid hydrochloric dilute	m. 20
Liquor arsenic hydrochloride	m. 3
Copper sulphate	gr. 1/100
Manganese chloride	gr. 1/10
Ext. Cascara Sagrada liq	m. 25
Glycerine	m. 15
Chloroform water	upto fl. oz. one

one dose after food thrice or four times a day

But for all practical purposes the copper and manganese salts may be omitted out. A simple prescription given above without the two ingredients may be ordered.[8]

Another useful prescription is

Ferri et ammonii citratis	gr. 20
Acid hydrochloric dilute	m. 15
Liquor Arsenic hydrochloride	m. 3
Syrup senna	m. 30
Peppermint water	up fl. oz. 1

one dose thrice daily after food.

6. Ibid., (1935), Achlor-hydria.
7. Jour. Amer. Med. Assoc. 25th Feb. 1933. p. 537.
8. Heath, (1933), Arch. Int. Med. 51 : p. 459-482.

In those cases where there is no constipation the aperients may be omitted.

Vitamin B is of additional use in rapid regeneration of blood, but it is rather expensive and often redundant. But yellow portion of egg (egg yolk) is a good source of iron and B vitamin and is an additional food of value. There are numerous combinations in the market containing malt iron, liver extract etc. which are suitable for the treatment of anaemia.

Transfusion of blood.

In very bad cases the patient may be made to tide over emergencies by the timely and judicious transfusion of compatible healthy blood free from communicable diseases like syphilis etc.

Anaemia of pregnancy[9,10] *and babies.*

Davis and Walker[11] (1934) in a series of 161 untreated and 131 treated cases of anaemia of pregnancy specially in poorer classes, came to the natural and interesting conclusion that there were more premature deliveries, greater incidence of toxaemia, higher foetal mortality and morbidity and longer labour in the untreated group. The treatment was mainly exhibition of iron during the whole course of pregnancy. As these pregnant anaemic persons are more or less achlorhydric, dilute hydrochloric acid with iron after food are likely to do better than iron alone.

Mackay[12,13] (1935-37) and previously others found that children from the age of six to twelve months are anaemic needed regular oral exhibition of iron. In such children the resistance was very low and morbidity and mortality from any infection unduly high. Milk which is poor in iron content should be supplemented by iron, or iron rich diet.

CHAPTER LXXVIII

PRIMARY ANAEMIAS

Chlorosis. This disease of young women usually between fifteen to twenty years, showing a peculiar com-

9. Reid and Mackintosh, (1937), Lancet, i, p. 43.
10. Smallwood, (1936), Brit. Med. Jour. ii, p. 574.
11. New Eng. Jour. Med. (1934), 210: June p. 1315.
12. Lancet, (1935), i: p. 1413.
13. Ibid. (1937), ii: p. 570.

plexion, with marked pallor of the mucous membranes, is becoming very rare in those countries like England, France where it was once very prevalent. There is always hypochromia but usually no oligocythaemia. Anaemic murmurs in the heart with other signs and symptoms of anaemia were common.

TREATMENT

Treatment were in the same lines as in secondary hypochromic anaemia. Iron, arsenic, hydrochloric acid, B vitamin and purgatives were of use and the beneficial results of treatment by the above drugs were striking.

PERNICIOUS ANAEMIA (Addison-Briermer type)

(Hyperchromic macrocytic anaemia)

Blood picture. Changes, specially in the red-blood corpuscles are more or less pathognomonic. 1. There is hyperchromia and relatively greater amount of haemoglobin per individual red cell, whose number is though usually lower than normal. 2. Many of the red blood cells are relatively larger than normal. There may be irregularity in shape (poikilocytosis) or size (anisocytosis). 3. There is as a rule leukopenia showing a total count of near about 3 to 4 thousand leukocytes. 4. In differential count the acidophile granular leukocytes (eosinophile) are much reduced, with a relative lymphocytosis. 5. As in severe secondary anaemia, so in grave cases of this type of disease there is almost always normoblasts and megaloblasts present in the peripheral circulation. 6. The platelets also diminish leading to prolonged bleeding time. Various cord lesions and recently optic atrophy are mentioned.[1]

The disease has got peculiar periods of exacerbation and remission. This period of sudden change in the blood picture is called blood-crisis. There is associated with it a peculiar smooth shiny tongue, whose mucosa are all atrophied or denuded down. This tongue condition is not uncommon in our country and is particularly described by persons of other lands. In our country these patients may not show the typical blood picture of primary hyperchromic anaemia, but they improve under injection of liver-extract, because of deficiency in vitamin B complex also.

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1. Cohen, (1936), Lancet, ii, p. 1202.

There may be achylia gastrica[2] with sub-acute combined degeneration of the posterior and lateral columns of the spinal cord.[3]

The disease comes on usually insidiously with disturbances of digestive system, feeling of weakness, early exhaustion, soreness of the tongue, lemon yellow complexion. Papitation, breathlessness on exertion are quite common.

There appears some familial tendency, in fair haired light complexioned subjects. It appears rather uncommon in the coloured people.[4,5]

In the light of modern researches *it is a deficiency disease.*

So far two factors have been found out whose deficiency appears to give rise to this disease. The first one is the specific intrinsic factor of Castle[6] (1928) present in the normal human gastric juice, this when interacted with the second factor encountered in the liver or its extract or in stomach extract, or good, protein lead to the formation of the specific anti-anaemic principle. The second factor found in the liver or stomach was erroneously supposed to be B vitamin. Castle's idea was disputed but ultimately proved to be true.[7]

TREATMENT

Treatment. Formerly remissions could probably be induced by intensive arsenical treatment and by the administration of dilute hydrochloric acid. But the disease ultimately proved fatal. But since the advent of liver therapy it has come under control.

Liver therapy. The foundation of this very effective line of treatment was laid on the researches of Whipple[8] (1926-28) Robscheit Robbins, Minot and Murphy and many others. They demonstrated the extraordinary efficacy of

2. Witts, (1934), Lancet, June 2nd, i, p. 1172.
3. Suzman, (1933), Arch. Int. Med. 51 : p. 1-21.
4. Mills, (1936), Amer. Jour. Med. Sci. 191 : p. 72.
5. Amer. year book of general medicine, (1934), p. 72.
6. Castle and Locke, (1928), Jour. Amer. Med. Assoc. Sept. p. 923.
7. Castle and Ham, (1936), Ibid. 107 : p. 1436.
8. Jour. Amer. Med. Assoc., (1928), Sept. p. 863.

liver therapy in numerous cases of pernicious anaemia. Originally liver was served in various dishes and about three hundred grams were the minimum requirement to produce satisfactory reticulocytic response. Further work showed that 12 to 14 grams of extract obtained from the above mentioned amount of raw liver when given orally produced effective result. But it was soon found out that, when given by injections, about 1/50th of this dose by intramuscular route was sufficient to elicit most favourable reticulocytic response.

Many of the recently discovered concentrated extracts of liver, such as liver-extract (Lilly) neo-hepatex (Evans) campolon (Bayer) are quite potent to keep such anaemias in check, provided they are given by weekly injections or at suitable intervals according to the severity and duration of the illness and potency of the remedy. The efficacy depends upon the reliability and dependability of the product. Fortunately there is evolving at present some definite means of assaying[9] these preparations. When combined with big doses of ferri et ammoni citratis and dilute hydrochloric acid orally, liver extract was found to be more effective, than when given alone. Liver therapy not only stimulates those immature red-blood cells to mature more quickly but also the immature cells in the circulation disappear. There appears some evidence that this anti-anaemic principle is stored in the liver.

Stomach extract. Sharp and Sturgis (1929) and others showed that 30 to 40 grams of desiccated pyloric portion[10] of fresh stomach (pigs') was quite effective in producing a satisfactory reticulocytic response. This was named ventriculin or ventricul powder, and had to be given orally and that daily. Gradually it was found out that liver and stomach when interacted upon previously and combined with large doses of iron were more satisfactory in the treatment by oral administration than any one of them given individually. Such a preparation is lextron (Lilly), which is to be administered in capsules, one three times a day, sometimes with gratifying results. Intramuscular injection of adisin, a concentrated stomach juice was found to be efficacious in this disease.

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9. Dameshek and Castle, (1936), Jour. Amer. Med. Assoc. 103 : Sept. 8.
10. Meulengracht, (1935), Proc. Roy. Soc. Med. 28 : May p. 841.

Transfusion of fresh blood. Before actually starting these lines of treatment in very severe cases it is better to transfuse some blood at two to three days' interval from some healthy and grouped donors.

Acid orally. Dilute hydrochloric acid in twenty to thirty drops with four times its amount of glycerine pepsin given after or before each meal may be of service, when combined with the above lines of management by liver therapy.

Subacute combined degeneration requires the above lines of treatment but in a more intensive form. Parenteral administration of liver extract in adequate doses for a prolonged period is the best preventive and curative of the disease of the cord.[11] But these injections may better be fortified by some preparation like lextron, coupled with big doses of iron and dilute hydrochloric acid exhibited orally. Recent army observation has shown that vegetarians show a macrocytic anaemia probably due to lack of proper extrinsic factor in their diet.[12]

Folic acid or Lactobacillus casei factor[13] *or Vitamin M. or chemically pteroylglutamic*[14] *(folic) acid* etc.

Effect on blood formation etc. "Folic acid is a specific antianaemic substance the lack of which results in megaloblastic dysplasia of the bonemarrow elements and anaemia the latter usually of macrocytic type."[15] White American children under 18 months showing macrocytic normochromic anaemia with hypogenesia and megaloblastic reaction of bone-marrow, are benefited by 5 to 20 mg daily doses of folic acid for a period of 8 to 21 days. Though it has the same action as that of liver[16] extract yet they appear differ-

11. Morris and others, (1932 and 1933), Jour. Amer. Med. Assoc. 1932: p. 1080, 1081, 1933. 100: p. 171 to 173.
12. Taylor and Chuttani (1944 June 9) Brit. Med. Jour. p. 100.
13. Darby, Jones and Johnson (1946 March 23) Jour. Amer. Med. Assoc. 130: p. 780.
14. Spies, Lopez et al (1947 May 3) Jour. Amer. Med. Assoc. 134, p. 18.
15. Zuelzer (1946 May 4) Jour. Amer. Med. Assoc. 131: p. 7.
16. Spies, Velter et al (1945 Nov.) South Med. Jour. '38: p. 707-709.

erent. Intramuscular injection of 15 mg of folic acid daily seem to cure the blood picture and symptomatology of sprue.[13] It helps in the growth of hair of animals and plumes of chicken. It does neither prevent the neuro-relapses of pernicious anaemia nor affect the cord changes[17] favourably. Not effective against iron dificiency anaemia.

CHAPTER LXXIX

LEUKAEMIAS

Kracke and Garver[1] (1935) in their excellent article on the differential diagnosis of leukaemias suggest that the most reliable criterion for diagnosis of any leukaemic condition is a preponderance of immature white blood cells, regardless of their total number. They also report a large series of monocytic leukaemia cases where the bone marrows were the sites of the trouble, as undoubted cases according to them, of monocytic leukaemia, have terminated in myeloblastic leukaemias. This last fact, unless corroborated further by other workers, is difficult to accept.

Our old classification is that leukaemias are of two main groups according to the preponderance of the types of the immature white blood corpuscles met with in peripheral circulation. They may be *myeloid or lymphatic* in type, both of which may be chronic or acute.

Myeloid leukaemia common in middle aged persons, somewhat uncommon in the young and in the elderly. Most of the cases consult doctors either for their vague ill health or other general symptoms such as pallor of the skin, enlargement of the spleen, pain in the splenic area etc. Pain or tenderness over the sternum on pressure may be an aid to the dignosis.

A stained blood slide under the microscope shows great increase of white blood cells, specially the myelocytes.

Lymphoid leukaemia. This is common in young persons, usally from the first decade onwards. There is

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17. Heinle and Welch (1947 March 15) J.A.M. Assoc. 133 : p. 739.
1. Jour. Amer. Med. Assoc. (1935) 104 : March p. 697.

usually a generalised adenitis and not uncommonly in young boys such enlargement of the midiastinal lymphatic glands may be the starting point of the leukaemic trouble. The cervical, axillary, inguinal glands may partake in the enlargement. Though the spleen in enlarged yet it may not reach the size met with in cases of myeloid variety of this disease.

Acute lymphatic leukaemia is a febrile disease with tendency to haemorrhage from mucous surfaces. Not uncommonly it has been confused with some of the acute infectious diseases, like kala-azar, malaria, sepsis etc. But the extreme anaemia, generalised adenitis, and the typical blood picture should settle the diagnosis. Kala-azar is sometimes indistinguishable from myeloid leukaemia and as a matter of fact two cases of myeloid leukaemia, were given injections of penta-valent antimony compound with untoward results. The typical blood picture characteristic of leukaemia is the most important diagnostic point.

The chronic form of lymphatic leukaemia is not uncommon amongst elderly people,[2] and the signs and symptoms may be indistinguishable from those of acute infections The average life span of a series of twenty five cases was two years in this sub-acute disease, in comparison with a shorter period of life of the acutely affected young persons.

There are numerous other aberrant forms within these types of diseases.

Anaemia. The out-crowding of the bone marrows and other active erythroblastic tissues by these leukaemic reactions, often leads to anaemia in most cases which may be very pronounced in some.

TREATMENT

The main object of treatment is to reduce the number of the white cells and to increase the haemgolobin and red blood count. Although this may not necessarily prolong life, yet will increase efficiency and well being, at least for the time being.

The treatment may be subdivided under the headings of *chemical, biological and physical.*

2. Panton and Valentine, (1929), Lancet. i, p. 914.

Radiotherapy is by far the most satisfactory form of *physiotherapy* because leukaemic tissues are markedly sensitive to the above type of rays. While treating a case, one should avoid a marked reaction or rapid regression to be effected in the leukaemic deposits. Rosenthal and Harris[3] (1935) employ fractional doses of roentgeno-therapy from plus 1 m.m. of aluminum filter, and the application of from 150 to 250, roentgens at each sitting. Under these conditions the radiation is better tolerated and fewer toxic reactions become manifest. In myeloid cases the spleen and occasionally the long bones, and in lymphatic cases the lymph-nodes and the spleen, were irradiated. The results of treatment under above circumstances may prove a bit slow, and should be controlled by regular count of white blood cells. When the count reaches near about 25,000, the exposures should be stopped, as the count is expected to fall further, as a result of the sustained effect of the already employed exposures.

Chemical. Benzol in 0.5 g. or 7.5 gr. doses with equal amount of olive oil in capsule, four times a day is given on the first day that means 2 g. or 30 grs. on the first day, on the second day six capsules making a total of 3 g. or 45 grs. on the 3rd day eight capsuls or 4 g.. or 60 grs. In order to prevent irritation of the stomach, the capsules should be coated with phenyl-salicylate; gastric irritation is a great draw-back in benzol treatment.

Regular count of both the types of the corpuscles, specially the white cells, should control treatment by benzol, and whenever the *blood count sinks to 20,000 white cells* per c.cm., or much anaemia develops, benzol treatment should be stopped, as cases are reported in whom a count of twenty five to thirty thousand white blood cells have sunk down abruptly to six to eight thousand, hence the importance of regular careful blood examination.

Arsenic. Formally arsenicals were much in vogue, but they produce only temporary results. The drugs used were, some liquor of arsenic in four to six drops with or without iron and dilute hydrochloric acid. Organic preparations like sulfarsenol intramusclarly have also been tried. Recently increasing doses of fowlers solution has been advocated but the results are not comparable with irradiation.

3. Jour. Amer. Med. Assoc. (1935), 104: March p. 702.

Anaemia. Anaemia should be treated on their usual lines. Liver extract injections may be of use. *Leukaemic retinitis and palsies*[4] are not uncommon and an ophthalmoscopic examination of the fundus and the retinal blood vessels will reveal the mischief.[5] The treatment is in general lines as above. *Radioactive Phosphorous*[6] both leukaemia and polycythaemia are being treated by radio-active isotope of phosphorous, but as it can only be prepared by a cyclotron and is not generally available for general use; it is not suitable for general use. The results appear encouraging.

COMMONER DISORDERS OF THE GLANDS OF INTERNAL SECRETION

CHAPTER LXXX

GENERAL.

There is a harmonious correlation and co-ordination of the functional activity of the various complex organs and structures of the human body through numerous guiding influences, of which the glands of internal secretion through their hormonic influence (bio-chemical regulation) and acting mostly through the nervous and other paths, are important. But all these also are to some extent inter-dependant. There is present some subtle balancing effect too between all these glands *themselves*[1,2].

The commoner diseases manifested in the human system, result either from hyper, hypo or dysfunction of one or more of these glands of internal secretion.

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4. Schwab and Weiss, (1935), Amer. Jour. Med. Sci. 189: June p. 766.
5. Frank, (1935), Med. Jour. of Australia, 22: March. p. 364.
6. Low-Beec, Lawrence and Stone (1942) Radiology 39: p. 573.
1. Crile, (1929), Surg. Gynecol and obst. March. p. 371.
2. Grollman and Firor, (1935), Amer. Jour. Physiol. 112: p. 310.

COMMONER DISORDERS OF THE THYROD GLAND

The active principle of this gland is called thyroxin.[3] Iodine in some complex form is the main active element.

But that the iodine requirement is very minute will be seen from the fact that some Swiss workers[4] have estimated that about fifty mg. of iodine is the annual requirement of an average thyriod gland. This is rather on the lower side of the calculation. Recently Harrington[5] (1936) has shown that all exogenous supply of iodine is absorbed by this gland, which through several changes comes finally to thyroglobulin and is stored as such in the thyroid gland.

Hypofunction. When the secretion is insufficient there follows two clear cut groups of syndrome according to the age of the person affected. It is called *cretinism* in the young growing persons, and *myxoedema* in the grown-ups and elderly.

Cretinism. These cretins are seldom taller than five feet. The body is relatively broad, the legs often short, the abdomen large and pendulous, the skin coarse and thick, facial expression dull, the tongue large and broad, lips are thick. The mental condition is dull too, without much of a memory or mind. The face is sometimes like that of an ape. Differentiation has got to be made from achondroplasia, dwarfism etc. But the slow pulse, low surface temperature of the skin, mental dullness, low metabolic rate, but probably much more important than anything else is a high cholesterol content of blood, normal being from 150 to 200 mg. per 100 c.cm. of blood. There may be epidemic or endemic[6] cretinism in certain parts of the world, probably due to some intestinal infection and toxaemia.

Myxoedema. There is dimished perspiration, dry scaly skin, these persons feel cold very easily and are very sensitive to it. The mental condition gets dull, gradully there is slow speech and movement, the memory is poor. Hairs tend to fall off, basal metabolism being lowered, the

3. Kendall, (1929), Thyroxin. Chemical Catalogue Co. pp. 265 N. Y.
4. Miller, (1929), Jour. Amer. Med. Sci. Jan. p. 98,
5. Brit. Med. Jour., (1936), ii, p. 1320.
6. Hellwig, (1937), Surg. Gynaecal. and obst. 64: p. 604.

patient may gain in weight. The cholesterol content of blood is much higher than normal. Gradually the typical appearance develops. The eyes are always puffy. The hands and feet show the characteristic pudginess. Myocardial derangements either functional or even organic[7,8] may not be uncommon. These subjects may show goiter too.

TREATMENT

This consists in giving of *half to two* grs. of extract thyroid siccum, in between meals twice or thrice a day, to be increased in dosage according to indications. Even upto a total of about ten to fifteen grains, may be given per day, with good results.

In regions of endemic goiter or cretinism or myxoedema small amount of sodium iodide mixed with the table salt shaker or alone is a good preventive. Too much of it taken for a long time may produce hyper-thyroidism with its associated evils.

HYPERTHYROIDISM

Over-action or perverted action of this gland results in a syndrome called for the want of better names, as thyrotoxicosis, hyper-thyroidism, and sometimes also in memory of the names of the original describers of this clinical entity as Graves' or Basedow's disease. It is also called "exophthalmic goiter."

There is a greatly increased rate of out-pouring of the secretion of this gland. Some think that the thyrotropic hormone of the anterior-pituitary to be a potential causative agent in initiating Graves' disease.[9] There is some evidence to show that the adrenal cortex also has some influence in bringing about this condition.[10] The very puzzling situation as to the differentiation between the toxic goiter and hyperthroidism (Graves' disease) has been clarified by the following lines of Bram[11] (1929). "In hyperthyroidism of

7. Gordon, (1929), Canad. Med. Assoc. Jour. Jan. p. 7.
8. Means, (1933), New Eng. Jour. Med. 208 : p. 541-543.
9. Harington, (1935), Lancet, i, p. 1199, 1261.
10. Langmead, (1929), Brit. Med. Jour. i, p. 715.
11. Med. Jour. and Record, (1929), May 15. p. 674.

toxic adenoma, which is a local disease, it is the thyroid which makes the body ill, while in Graves' disease, a constitutional condition, it is the body that makes the thyroid ill."

Clinical symtoms and signs. Clinically there are several interesting findings in this condition. The gland may be diffusedly enlarged sometimes with palpable nodules (adenomata) and visible pulsation over the affected parts. It is much more common in young women, who show marked tachycardia, with rather loud first sound, tremor of the extended hands, protrusion of the eyeballs which look somewhat staring, etc. Nervousness, excitability, raised basal metabolic rate, tendency towards excessive perspiration and menstruation, diarrhoea, etc. are common.

The dangerous thyroid crisis usually ushered in by an attack of diarrhoea and vomiting, very high pulse rate, profuse sweating and restlessness, may follow in these subjects under the strain of any acute infection.[12]

DIAGNOSIS.

Though the clinical findings and the determination of the basal metabolic rate are useful diagnostically yet, Bram[13] (1928) suggested that these patients have got a relative immunity to cinchonism. But Roger's modification[14] (1928) of Goetsch's test may be of help in out of the way places. The patient should rest in bed and the test explained to her and re-assured, that there is neither pain nor risk. The pulse rate and the systolic pressure are taken at rest, for several times and the mean found out. Then 0.5 c.cm. of fresh one in thousand adrenalin chloride solution is injected subcutaneously. For the next fifteen minutes a further series of the readings of the pulse rate and blood-pressure are taken. A rise of twenty or more beats per minute in the pulse-rate or of ten to fifty m.m. of mercury, in the blood-pressure, are evidences of increased response to adrenalin, and are typical of hyperthyroidism. Robinowitch[15] (1935) thinks the pulse-rate and blood-pressure are quite good guides to a proper diagnosis, and according to him as good as determination of basal metabolic rate.

12. Arch. of internal. Med, (1928), July. p. 53.
13. Lancet, (1928), ii, p 970.
14. Lahey, (1928), New Eng. Jour. Med. Aug. 9. p. 253,
15. Canad. Med. Assoc. Jour. (1935) 32 : Feb. p. 135,

TREATMENT

Rest etc. This consists in giving both mental physical rest in a cool, quiet dark room, for six to eight weeks, on a milk, vegetable and fruit dietary. (Lactovegetarian diet). If there is marked tachycardia orally two to five grs. of quinine bihydrobromide, or simple hydrobromide of quinine thrice daily, and an ice cap over the chest may do good. Auricular fibrillation[16] is common and rarely heart-block may take place, congestive cardiac failure, may be the cause of death and this requires proper measures, of which sub-total thyroidectomy now thiouracil is probably one of the best.

Emaciation. In cases of great emaciation showing poor appetite, coupled with nervousness and anorexia, subcutaneous injection twice daily of five to ten or more units of insulin, fifteen minutes to half an hour before meals, increase the appetite and promote intake of food which help the patient in gaining weight. This method is now being employed in, anxious thin normal subjects, under-nourished tuberculous patients, and in anorexia nervosa with encouraging results. This line of treatment may have to be continued for a period of three weeks or longer.

Septic foci. Chronic foci of infection anywhere in the system, should be removed, and they may also be causes of simple goiter.[17]

For the trouble-some diarrhoea, besides systemic measures, one may try the following in tea-spoonful doses stirred with water twice daily after meals.

Bismuth betanaptholate	gr. 30
Calcium phosphate	
Calcium Carbonate	aa oz. one

Thiouracil has been a great advance and has made surgery almost unnecessary in cases of thyrotoxicosis. It is very useful. "*Thiouracil* a derivative of thiourea exerts a powerful depressant action on the production of thyroid hormone and hence has been applied clinically to secure the reduction of the basal metabolism rate in thyrotoxic

16. Barker and others, (1932) Amer. Heart Jour., 8: p. 121-127.
17. Abbolt, (1932), Canad. Med. Assoc. Jour, 27: p. 376-380.

patients.[18] It is given orally in three to four divided doses so that the daily total is 0.5 to 0.6 gm. In America some of the workers gave an initial high one gm daily dose for three days to be followed up by 0.5 to 0.6 gm daily for first two weeks, then 0.3 to 0.4 gm daily until the basal metabolism rate came as near normal to be reduced to 0.1 to 0.2 gm daily[19] usually by the 6th to 8th week. Recent studies show that not only the thyrotoxic condition improves but also the effects on the heart, diabetes resulting from excessive thyroid action also improve considerably. *Dangers are*[20] (1) neutropenia even agranulocytosis which may appear suddenly, hence white cell count need be done every third day specially when on big doses initially neutrophils below 45 percent usually means danger signal and stoppage of the remedy. (2) *Sulphanilamides* should not be given along with this drug. (3) *Sudden rise of temperature, arthralgia, myalgia, rashes* of various types *lymphadenopathy, oedema legs* when persistent prompt cessation of the drug. Pyridoxine or Vitamin B[6] in 150 mg doses orally daily prophylactically and 200 mg intravenously as a curative for agranulocytosis is the best antidote.[21]

Thiouracil need be given in comparatively smaller doses and that with caution to pregnant women and probably to nursing mothers.[22] It has been found useful also in Angina pectris, mostly by lowering metabolic rate.[A]

Iodine therapy. On the indications of iodine therapy there are two sets of opinion. One group think that Lugol's iodine may only be exhibited in cases who are preparing themselves for an operation,[23] and unless operated iodine therapy makes the case worse. Whereas there is the other group, who including Marine[24] (1935) are of opinion that bad

18. Fishberg and Vorzimer (1945) July 28 Jour. Amer. Med. Assoc. 128 : p. 915.
19. Williams and Clute (1945) May 12 Ibid. 128 p. 65.
20. Astwood (1943) Ibid. 122 : p. 78.
21. Eaton (1945) Lancet 1. p. 171.
22. Davis and Forbes (1945 Dec. 8) Lancet 2 : p. 740.
A. Raab (1945 May 26) Jour. Am. Med. Assoc. 128 : p. 249.
23. Winkenwerder and others, (1932), Bull. John. Hopkins Hospital, 51 : p. 282-299.
24. Jour. Amer. Med. Assoc., (1935) 104 : June 29. p. 2334.

result follow the use of iodine in "toxic adenomata," secondary to Graves' disease, and not in the primary form. The reduction in the number of cases coming up for operation, according to them, is due to the value of iodine, mainly as a prophylactic and partly as a curative.

Tyronorman.[25] It is a catechin which is given as tablets, two or three times a day in milk. The diet should not contain any meat or fish or other proteins, except lactovegetarian elements. Milk up to two liters are useful. Before beginning this therapy the iodine treatment should be stopped. Smoking, tea, coffee, alcohol are best avoided.

Deep rays. Poulton and Watt[26] (1934) had good results in eighteen out of twenty of Graves' disease, under deep X-ray therapy.

Quinine and Vitamins, etc. As already suggested *quinine* hydro-bromide in three to five grs. twice or thrice daily are advocated. Wendt[27] (1935) recommends the treatment of hyperthyroidism by massive doses of A vitamin. Some advocate extract of pregnancy urine, others adrenal cortical extract etc. All these show that the results of therapy are unsatisfactory.

Surgery. Graham and Wallace,[28] (1934) in revising the case notes of one hundred and twenty-five cases of toxic goiter treated surgically, report that ninety percent of these patients were fit enough to resume their employment. Nothing speaks more brilliantly of the results of surgery under capable hands than the above data.

COMMONER DISEASES OF THE NERVOUS SYSTEM

CHAPTER LXXXI

Commoner Forms of Neuritis

GENERAL.

In all forms of neuritis there are certain aetiological factors. The commonest of these are septic foci anywhere in the body, e.g. teeth, tonsils, gall-bladder, appendix, gastro-

25. Blum, (1935), Med. Press and Circ. 190: Fe. 27. p. 195.
26. Lancet, (1934), ii, Sept. 8, p. 535.
27. Munch. Med. Woch, (1935), 82, July 19: p. 1160.
28. Brit. Med. Jour. (1934), ii, Nov. 10: p. 845.

intestinal, respiratory, genito-urinary systems, inflammation of the various sinuses of the body etc. Trauma, diabetes, deficiency of vitamin B, are quite common in giving rise to these painful states. Gout, rheumatic affections, local pressure or spread of inflammation of contiguous structures may be the beginning of the whole mischief. Poisons like lead, alcohol, arsenic, may have also their share in the production of this condition. Acute infectious diseases, allergy, etc. may cause neuritis.

SCIATICA

This may be due to a spreading lumbosacral fibrositis, which starts usually as a perineuritis, to spread inside the interstitial tissues of the nerve fibres. The foramen of emergence might have been small hence the pressure on the nerve might have caused this pain. Sitting on a very hard chair for a long time, notably in a faulty posture,[1] with or without local chilling[2] may start the trouble. The pain at the beginning may be limited to the buttocks only, to spread to the back of the thighs, thence to the calf and ankles. The ankle-jerk is lost in majority of these cases, indicating extension of the inflammation in the nerve fibres within the sheath. The pain is aggravated on stooping, or at straining or coughing. Any other act which stretches the nerve causes greater pain. There may be tenderness on pressrure. These cause the peculiar posture in which the lower limb is placed and the gait is also helpful in diagnosis.

TREATMENT

Wherever possible all the *septic foci should be removed*, and the other exciting factors, as judged from the history and physical examination etc. should be eliminated. A diet rich in *vitamin B such as eggs, liver-substances* even injection *of B complex* or liver extract may have to be supplemented. *Non-specific protein therapy*, injection of the two courses of *vaccineurin, a patent remedy*, may have to be tried in intractable cases resisting average treatment. *Metabolic* disorders, any slow poisoining, should also be corrected where-ever suspected to be the underlying cause.

1. Clayton, (1936), Brit. Med. Jour. ii, p. 380.
2. Copeman, (1936), Jour. Amer. Med. Assoc. Octo. 17: p. 1295.

WARMTH, COUNTER-IRRITANTS ETC.

In bad cases *rest*, preferably on a soft bed, warmth, local application from the back of the thighs up to the ankle, of some good counter irritant like the liniment prescribed under the treatment of rheumatic fever may do good. The limb should be kept *in the position of maximum ease and rest*, as any strain or stretching is apt to delay the recovery. Covering the whole limb with cotton wool, fastened in position by some *warm bandages*, or ordinary military "pottees" may give some relief. Application of warmth, in any form, such as *hot water bottles*, *fomentation*, rubbing of *warm* iron etc. may give some comfort. Vigorous rubbing of the affected parts should always be avoided. Where procurable, and after the acute symptoms have abated, *radiant heat-lamps*, or better still heat from *infra-red* lamps, applied twice daily, half an hour each time may prove of relief.

Medicinal etc. The bowels should be kept open by divided doses of *hydrarg sub-chloride* followed by salines. Bed-pans may be too painful to use hence commodes are better. The orthodox Indian way of sitting at stools may prove extremely painful.

A prescription like the following may do good at the acute stages with a tendency towards constipation.

Phenacetin	gr. 2
Sodium Salicylate	gr. 8
Soda Bicarbonate	gr. 16
Ext. Cascara Sagrada liq.	m. 30
Tr. Belladonna	m. 8
Syrup Orange	m. 60
Chloroform water upto	fl. oz one

one dose thrice daily. If there is too much pain, four to five grs of saridon may be added per dose of the above prescription.

Painting of the back of *the thighs with strong tincture iodine solution*, along the course of the nerve, has been tried with some advantage. Alternate local application of *methyl salicylate and A.B.C. liniment* every four hourly may be of use.

Diet and Bowels etc. The diet of the patient should be simple but nutritious with abundance of all the vitamins, specially B. If the subject is thin, tonics like syrup minadex,

ferradol, etc. may help. Sufficiency of *animal protein* builds up body resistance and hence should be given wherever possible. The bowels should be kept regularly moving, and is of good use.

PAIN ETC.

If the pain is very acute and unbearable, injections of morphine, atropine may have to be taken resort to. In one severe case of sciatic-pain in an overweight middle aged woman, injection of 1/3 gr. of *morphine* combined with 1/100 gr. of *atropine* relieved the pain only for an hour or so, but a prescription like the following, gave her relief for more than four hours.

Medinal	gr.	4
Luminal	gr.	1
Saridon	gr.	5
Sugar of milk	upto gr	20

one powder when the pain is unbearable after some food, not to be repeated before six to eight hours.

A cheaper powder like the following may be used but probably is not so efficacious as the above one.

Sodium Salicylate	gr.	6
Phenacetin	gr.	3
Luminal	gr.	1½
Soda Bicarbonate	upto gr.	20

one powder every six to eight hourly. To this, one may add about two to three grs. of caffeine citrate, but the caffeine due to its cerebral stimulant action, is likely to keep the person awake and also make him feel the pain more intensely. The depressants usually counteract the cerebral-stimulant action of caffeine, hence it may be used with the above prescription, specially during the day time, with lesser dose of luminal.

INJECTIONS INTO THE NERVE.

A small percentage, say about ten percent of cases, will have, while walking, a little pain lingering as yet or there will be a certain percentage of people, who would get no material relief from the above lines of management. In them one *injection* of about five to ten c.cm. of *one per cent novocain* solution into the nerve at the sciatic notch and also at the level of ischial tuberosity should be followed by the *injection of fifty to hundred c.cm. of sterile normal saline*

into the nerve sheath, by stretching of the components of the nerve and also by the local irritation will help in setting up a reaction, leading to good therapeutic result, in a comparatively short period of time.

ACUTE RADICULITIS.

In a very small percentage of cases there may be present an acute inflammation of the nerve-roots, which is not amenable to the above line of therapy, and there develops a characteristic scoliosis on the contralateral side, inorder to relieve the pressure on the roots of these nerves at their point of emergence. Skiagraphic examination of the spine may also help in the diagnosis. The only partially useful line of treatment is to put the patient in a plaster jacket.

Surgery. Nutter[3] (1936) refers to a surgical operation of use.

BELL'S PALSY.

If the patient is seen in a few days' time, rest, local application of warmth, counter irritants gently applied, with gentle massage, purges, salicylates, covering the part with cotton wool and thus keeping warm may help in quick recovery. Energetic local treatment by the application of *heat, counter-irritants* started from the earlier stages of this inflammatory condition, may bring about cure nearly or fully completely, provided there is no local anatomical abnormality. The signs of improvement are in return of muscular tone and disappearance of the deformity before voluntary power returns. Salicylates and iodides may do good.

Cases showing reaction of degeneration, or those who do not improve under the, above regime, should better be treated electrically, by galvanic current. There may be recurrent[4] facial palsy.

OTHER FORMS.

The other forms of neuritis demand the same line of treatment as is indicated in the management of sciatica. Of course, there will be difference due to their respective peculiar anatomical distribution. Recently, quite a number of cases of neuritic pain have very successfully been treated by the writer by injections of vitamin B, given best in the

3. Nutter, (1936), Canad. Med. Assoc. Jour. 35 : July,
4. Merworth, (1935), Amer. Jour. Med. Sci. 189 : Feb. p. 270.

form of injectable liver-extract. In the other acuter forms, rest in the most comfortable position may do good when combined with other forms of treatment.

CHAPTER LXXXII

CEREBRAL VASCULAR LESIONS

Diagnosis as to the nature of the lesion.

Embolism. Generally there is a source of embolus such as in mitral valve lesion, *septic endocarditis*, *aortic disease* or *aneurysm*. Emboli may also be caused by *air*, *fat*,[1] *tissue or tumour cells* etc. It comes more or less with sudden symptoms, not uncommonly, a fall, or a fit or violent strain, by helping the dislodgement may precipitate an attack of embolism. The symptoms, more or less quick in onset, depend up on the site of damage.

Haemorrhage. The only sure diagnosis lies in finding of blood in cerebro-spinal fluid by lumber puncture, trauma, during puncture causing bleeding having been excluded. But suggestive points are a former history of hypertension, or chronic kidney disease, with booming first sound at the apex, and accentuated second sound in the aortic region. When the attack occurs during anger, fury, passion, after meals, or during defaecation etc., and the unconsciousness is rapid in onset and deepens, and without any premonitory symptom is likely to be haemorrhage. Not uncommonly previous thrombotic attacks, bring about pathological changes on the surface of the brain with loss of the support of the blood-vessels, leading to their easy rupture. Pin-point pupil, high rise temperature, paraplegia etc., point to pontine haemorrhage. The subjects may be short necked over weight individuals, who have lived well.

Thrombosis. This may also be common in subjects of hypertension, whose blood pressure might have fallen down temporarily. The hypertension having injured the vessel and the slight lowering of blood pressure and slowing of the current helping the formation of the thrombus. In comparatively healthy looking young persons, with rather low blood pressure, syphilitic meso-arteritis is a common cause of thrombosis.

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1. Vance, (1934), Amer. Jour. Surg. 26: Oct. p. 27.

It usually shows some premonitory symptoms, and not uncommonly takes place at the late hours of night during sleep, and after or during infection, inanition, purgation or starvation, all tending to make the cerebral circulation slower than usual, thus contributing to the formation of a clot inside the vessels. Generally it is said that if the patient survives the apoplexy it is unlikely to be haemorrhage. Many old people otherwise healthy die of cerebral thrombosis.

The signs and symptoms are more or less those of hemiplegia, with or without other associated symptoms.

TREATMENT

From the point of view of treatment though the distinction between the various causative factors is not of much importance, yet it is better that every doctor should have some idea *as to the nature and site of the lesion.* The changes brought about by syphilitic meso-arteritis, are to some extent, and rarely completely, amenable to treatment by anti-syphilitic and other measures.

At the beginning of an apoplectic attack it may be difficult to determine how much of the loss of cerebral function is due to *circulatory disturbances* in the healthy areas, secondary to *cerebral oedema*[2] and raised intracranial pressure and how much to *actual tissue damage.*

During the attack. Absolute rest, mental and physical, good nursing to avoid all efforts are important. The patient's head and shoulder may be slightly raised by pillows etc., or the head end of the bed raised by blocks. When deeply unconscious care should be taken to see that the tongue does not fall back. To prevent hypostasis, turning him to sides may be useful. Efficient cerebral circulation should *be maintained, by stimulants specially in view of the raised intracranial pressure.*

If there is *active bleeding* going on and the physician happens to be present there, drawing out of a few ounces of blood from one of the veins, and making the patient inhale amyl nitrite may be tried. In haemorrhage an ice-cap on the head may be useful, but in thrombosis it may help in the spread of the lesion.

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2. Luhan, (1936), Arch. of Nerol and Psychiat. 36: p. 42.

The *unconsciousness* if deep without cyanosis, lumber puncture may be of use. Much blood in the cerebrospinal fluid coming under considerable pressure usually means a grave outlook. Cyanosis may indicate venesection upto ten to fifteen ounces.

The old practice of exhibition of *croton oil* is not without danger. Daily *enema* for the action of the bowels may be quite enough. Those showing high bounding pulse and other signs of hypertension may easily be *starved* for a day or two,, small amounts of water, only being allowed acccrding to requirement. Whereas persons of feeble health, with low blood pressure, require *frequent feeding of liquids with diffusible stimulants* like *spirit chloroform* and *spirit ammon aromat* in ten to twenty drops each. Difficulties in swallowing suggest nasal feeding. If there is restlessness, *chloral and bromide* in half a dram each as retention enema, or sedatives of the *barbiturate group,* better still half an ounce of *paraldehyde* with equal amount of olive oil or four times its volume of normal saline shaken well, may be given rectally. Care should be taken to *avoid retention of urine,* if required, the bladder should be empited by periodic catheterisation with aseptic precautions.

Hemiplegic stage. Even before the hemiplegia becomes apparent, the hand and leg of the affected side should not be allowed to lie in one position for any length of time. The arm tending to come near the trunk, should be kept away from the body by a pillow, in the axilla, the forearm should be supinated several times a day, and kept in extension, the wrist and fingers resting on a light suitable splint, to prevent spontaneous flexion and wrist drop. Massage and passive movement with or without camphorated oil, should be given twice or thrice a day.

It is only by systematic painstaking conscious efforts, passive and active movement, massage and counter-irritation that the spasticity, contractures and deformities are avoided and a useful limb obtained. The patient's natural tendency to walk with extended, loglike stiff leg, by circumduction and swing, should be corrected and flexion of the leg at the hip and knee encouraged. Electricity appears not of much use here. Even while at rest the patient should be requested to see that the contracted faulty postures and

movements are avoided. The subsequent wasting[3] of muscles etc., requires, massage, electricity, re-education, passive and active movements. In intractable conditions with contractures the opinion of a surgeon may be useful.

The Wassermann reaction of blood and the cerebrospinal fluid should be examined in every case and if found postive, treated by oral use of potassium iodide, and injections of bismuth, neoarsphenamine and others.

During the *stage of unconsciousness or when the patient is confined to bed,* care should always be taken to prevent bed sores, cystitis. Regular bowel movement, proper remedy of the painful involuntary spasm of the limb below the level of the lesion may be important. In severe pain in the paralysed limbs, bromide, belladonna, aspirin in suitable doses may be relief. For the details of these, the chapter on fever and typhoid fever dealing with care of the bowels, urinary bladder, skin, prevention of bed sores, etc., may be consulted.

The lines of management of the unconscious and paraplegic patient are more or less as above, as symptomatic treatment is concerned.

Drugs. These are to be given according to the underlying cause. Iodides, bromides and hypotensives may do some good.

MIGRAINE

CHAPTER LXXXIII

(Paroxysmal headache)

DIAGNOSIS ETC.

Migraine is only a symptom and not the disease. It generally appears as an intractable hemi-crania starting with or without premonitory symptoms, most commonly from waking in the morning, when on raising his head from pillow the patient feels a sense of vestibular disorientation with giddiness, ocular confusion and nausea as is experienced at the beginning of sea-sickness. There may be visual disturbances and vomiting. The face becomes pale and gray, the

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3. Winkelman and Silverstein, (1935), Amer. Jour. Syph. and Neurol. 19 : p. 58.

patient much prostrated, incapable of physical and mental effort. Light, noise and movement may aggravate it. In the milder forms physical strain, exposure to sun, fatigue, confinement in small rooms, even in railway compartments, crowds etc., will make the condition start or make it worse if already present.

As to the aetiology there are so many factors, but commoner amongst them being, psychological, endocrine, allergic, ocular, gastro-intestinal, hepatic and such like disturbances, notably of the sympathetic system.[1] In some more than one factor may operate.

Preliminary study of the case. First thing that needs be done is the correction of the error of refraction as it is one of the commonest causes of migarine, besides this, a complete examination of the whole system with particular attention to the neurological aspect of the case may be of service. Though sounds peculiar, ausculation over the skull may reveal congenital aneurysms and the rarer cerebral angiomata. A radiogram of the skull may help in the diagnosis materially. Hepatic, biliary or gastroduodenal troubles require study of their function and secretory activity, skiagraphic investigation etc. Allergic cases also should be tested by careful cuti-tests. A full detailed examination of the blood may prove of use. When the investigation is complete the plan of management may be consideied under several heads.

TREATMENT

Prevention of the attack.

For this purpose luminal half to one and a half grs. twice daily, for a long time, is probably one of the best. Those who cannot tolerate this drug, may be given prominal in one to three grs. at night time.

Extract thyroid siccum in 1/6th to 1/2 grain, nitroglycerine in 1/200 to 1/100 gr., thrice daily may be of some value. Gowers' favourite prescription[2] is the following which should be taken thrice daily after food for a very prolonged period to get any appreciable permanent effect.

1. Love and Adson, (1936), Arch. Neural, and Psychiat 35 : p. 1203.
2. Collier and Adie, (1933). A Text Book of Practice of Medicine. Edited by Price. Fourth Edition, p. 1647.

Liquor trinitrini	m.	1
Liquor strychnine	m.	4
Sodium bromide	gr.	10
Acid phosphoric dil	m.	10
Tincture gelsemium	m.	5
Glycerine	m.	20
Chloroform water upto	fl. oz.	½

Foreign proteins etc.

Allergic migraine is treated by subcutaneous or better still intradermal injections of fifty per cent sterile peptone solution, starting initially from one minim, increased by one upto three minims. At the beginning it is given on alternate days, and the last three minims should be continued for at least twenty days. Big doses of *calcium* and *D vitamin* are worth a trial. In biliary cases, sodium glycocholate in five to ten grs. or bigger amounts, till mild poisoning symptoms appear or decholin one to two tablets thrice daily may be ordered. Non-surgical drainage of the gall-bladder may prove of good use. Menstrual migraine requires injection of one c.cm. of theelin (50 rat units) on alternate days, one week previous of the starting of periods. Eumenin complex (Glaxo placental extract) in one to two ounces orally, twice daily, except during the menstrual period, may be tried with advantage. Thyroid orally as directed above, half a c.cm. of pituitrin injections weekly, may be tried.

Treatment of a threatened attack. Though there is nothing which can assuredly abort an attack. Yet any thing which is good as an analgesic such as mentioned in next paragraph may be used for this purpose. A prescription like the following may be of use.

Potassium bromide	gr.	10 to 20
Phenacetin	gr.	2 to 3
Caffeine citrate	gr.	1
Sugar of milk	upto gr	30

one dose when there is reason to suspect the on-coming of an attack A cup of tea or coffee, or even a saline purgative may prove of use. Calcium in big doses, may be tried too.

During an attack. The patient should be made to retire in bed in a quiet dark-room free from noise, bright light etc. Food and drinks are better avoided. Any suitable analgesic like, veramon, veganin, compral, saridon, anacin, phenacetin, etc. may be of use; the following may usefully be given every four hourly.

Potassium Bromide	gr.	20
Chloral hydrate	gr.	15
Mucil tragacanth	q.	s.
Soda Bicarbonate	gr.	20
Syrup zingiber	m.	60
Camphor water upto	fl. oz	1

Adrenalin injections intramuscularly in half a c.cm. or orally ephedrine in 1/4 to one gr. every six hourly may be of use. Injections of adrenalin may produce striking improvement in a few cases.

Ergotamine tartrate.[3,4] This promising remedy, sold under the trade name of femergin (Sandoz) is given in 0.25 to 0.5 c.c. by intra-muscular injection. The good results are often phenomenal in cases of migraine, though rarely vomiting, and uterine contraction in the females may result. In severe symptoms half the average dose may be given per vein slowly, well diluted, but previous to this the sensitiveness of the patient should be tested by giving half the dose intra-muscularly. Soltz and his co-workers[5] (1935), have given this remedy in 1/60 gr. or in-about one mg., once, twice or thrice a day, according to indication etc., with promising results. But the best and often dramatic results follow the injection of the drug. It is also a good preventive of migraine in the above doses, given orally once or twice daily or better still, by injections. Rarely gangrene may follow its use.[6] Ergometrine may be an improvement on this remedy and is free from the untoward effects.

It has been shown that *migraine, menstrual migraine and relaxation headaches* are frequently associated with a relative decrease in effective arterial blood volume. The low oestrone content of blood immediately preceding menstruation is associated with haemo-concentration and may in many be the precipitating factor of menstrual headache.[7] Pregnancy by increase of blood volume relieves it. Relaxation causes peripheral vaso-dilation which when associated with diuresis cause this headache.

3. Maier, (1935), Jour. Amer. Med. Assoc. 105 : p. 169.
4. Maier, (1936), Ibid. 107 : p. 1208.
5. Bull. Neurol, Ins. New York, (1935) 4 : p. 432.
6. Jour. Amer. Med. Assoc. 106 : p. 1625. Ibid. p, 1631,
7. Davis (1938) Surg. Gynec and Obst. 66 : p. 426.

Micapon, tablets (P and D.) contains potassium chloride and calcium lactate in such proportion as to contain the ratio of 3 moles of potassium to one mole of calcium, and that of blood.

Dosage—Two tablets taken after breakfast for the first 3 days, this is increased to six tablets, 2 after each meal, by the end of the first week. This daily dose should be continued for one month, by which time the dose should be reduced to 1 or 2 tablets daily.

Some may prove refractory[8] when micapon tablets should be given during an impending attack. I found it useful in a few cases tried.

Surgery. Various surgical measures are being tried for the cure of this disease with some success.

Improvement in general health etc. If the attacks are frequent and violent, the patient's general health is likely to be much undermined. The women suffer most from it. Treatment of such cases may prove very difficult. *Ephedrine hydro-chloride* in 1/4 gr. thrice daily may be tried. Bitter alkaline mixtures before meals, followed by dilute hydrochloric acid, in twenty to thirty drops, with or without three to six grs. of ferrous chloride after meals, may improve matters, in anaemic subjects. Graduated physical exercise, deep breathing, good vitaminous diet, massage, hydrotherapy etc. may do good. Cool bracing climate, amongst cheerful environments, with methodically careful and well regulated life may also do good. The watering places of Europe are popular to those patients who can afford.

Psychological. If there is any reasonable psychological basis for these cases, treatment under a capable psychoanalyst may do good.

CHAPTER LXXXIV

EPILEPSY

DIAGNOSIS ETC.

Epilepsy is a symptom and not the disease. There occurs in it occasional attacks of fits, representing discharge

8. Pfeiffer et al (1944) J. Lab and clin. Med. 24 : p. 709.

of excitability on the part of certain motor nerve cells. Reduction of these, without at the same time any harm to the normal function, is the aim of the doctor. With our increase of knowledge in the pathogenesis of epilepsy, the "cryptogenic" group is narrowing down. The causes may be traced to vascular changes, infections, cysticercosis,[1] growths,[2] gummata, syphilitic lesions, injury,[3] chemical, or internal secretory changes etc. This abnormal state of the cerebral neurons may either be inborn or acquired.

Commonly starts before the age of fifteen. Alcoholism in parents, fright, injury, reflex from any irritation after or during acute fevers, or previously mentioned pathogenic factors may be the initial cause of an attack. There are two forms of the disease *Grand mal or major fits, and petit mal or minor epilepsy*. The fits (major) usually are heralded by aura which may be motor, sensory, psychic etc. There is sudden loss of consciousness, may be with a cry, and the patient passes into the tonic, then a clonic stage, followed by post-epileptic automatism or sleep. The patient injures himself, passes urine or faeces involuntarily, bites the tongue, during an attack. There has been records of the patient having done criminal actions, during post-epileptic automatism. These differentiate the disease from hysteria in which the patient never injures herself.

The *minor fits* may appear as *sudden lapse* in action or conversation, sudden starting or dropping of articles, fainting or strange feeling etc. There are numerous other details which need perusal from proper texts.

Dangers. The fit when comes while bathing or near a fire, there may be risk of life. In crowded streets etc. when such attacks occur, or if the person is the driver of any vehicle or engine, there is great risk. There are numerous ways in which an epileptic not only endangers his own life but he may be a source of danger to others, though without himself realising it. These persons in war time create problems in the active service.

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1. Dixon and Smithers, (1934), Quart, Jour. Med. 27: p. 603.
2. List, (1930), Arch. of Neurol, and Psychiat. 35: p. 323.
3. Schueck, (1928), Archf. f. Klin, Chir. Nov. p. 77.

Mental condition. As a rule, in the majority, the mental condition deteriorates along with the progress of the disease, but rarely subjects of epilepsy have shown exceptional mental brilliance and that even without any deterioration of the cerebral faculties. Ultimately the mind becomes almost vacant, and many epileptics, not uncommonly end their lives in asylums, in a very wretched plight.

Distinction however has got to be made from all other causes of convulsions, fits, particularly from hysteria, and other psychological disturbances giving rise to akin clinical picture.

TREATMENT

Preventive. Though in a large proportion of cases preventive measures are not of much avail, yet any source of irritation, particularly in the alimentary canal, ears, eyes, nose, tonsils, teeth, in the form of colic, ear-ache, error of refraction, adenoids, infection, impacted wisdom tooth, respectively, when remedied may improve matters. Intestinal worms, nasal polypi, tight prepuce, etc. should be properly treated. Attention to the mental health and hygiene may improve the case.

General measures. Unless there is something very untoward, or unduly risky, the patient may be allowed to take part in out-door games and pleasant recreations. In bad cases regular physical exercise under supervision is required. Some form of bodily exercise is of use, as, a good physique stands many illnesses and can over-come things which a person of poorer body won't be able to resist.

One should try to ascertain if there is any one or combination of circumstances or abnormality of the body and mind, responsible for an attack. Immediate attacks not uncommonly are precipitated by such factors like, over eating, fatigue, undue strain or exertion, anxiety, emotional excitement etc.

Diet etc. Diet should be nutritious but simple. Restriction in meat diet is advocated, but in our country, most people take meat once a week or so, that need not be interfered with, but the quantity should be reasonable. Rich diet is unsuitable. Fruits, milk, vegetables, with abundance of vitamins may be helpful. If there is any article to which the patient is found sensitive, it should be stopped. Injections

of foreign proteins, including snake-venom,[4] have not given uniform results. It may only be tried on cases sensitive to food factors or other allergens. At times cases appear to improve on a salt-free diet. Constipation, indigestion etc. should be corrected.

KETOGENIC DIET AND STARVATION.[5]

Ketogenic diet with a proportion of three to four parts of fat to one part of carbohydrate and protein, the former being ketogenic and far in excess over the latter two anti-ketogenic ones, cause ketosis in young patients. In adults to produce proper ketosis is not very easy, but the above lines of dietary may prove of use. Starvation which acts probably by producing ketosis, from oxidation of reserve fatty tissues of the patient, and by partial dehydration and lowering of chloride content, has been helpful in some cases, in warding off attacks.

Some useful remedies;—Sodium diphenyl hydantoin sold as dilantin sodium, or epanutin kapseals (P.D.) Eptoin (Boots) Hydantal (Bur. Wellcome) Solantoin (Glaxo) in 0 1 g or 1½ gr. doses one after food thrice daily alone or better in combination with phenobarbitone like luminal (Bayer), or gardenal (May & Baker) solmonal (Richter) or prominal or phemitone have been found useful in most cases of epilepsy.[6] Hydantoin controls fits ably and does not produce the peculiar sleepy feeling produced by the prolonged use of the other sedatives. As it does not cure hence the patient has got to take it in some dosage depending on the therapeutic response for the rest of his life.[7] In those cases where the fits increase on its use, it should be stopped. I am glad to say that in combination with sedatives hydantoin has given satisfactory results in most of my cases of epilepsy though some of them were rather refractory ones. Recently Anti-sacar compound (Wander) consisting of a combination of atropine, caffeine, phenobarbitone, hydantoin, potassium bromide is likely to be of much service.

4. Spangler, (1925), Arch. of Internal, Med. 36: p. 779.
5. Macht. (1936) Proc. Nat. Acad. Sci. 22: p. 61.
6. Lennox (1940) Jour. Amer. Med. Assoc. 114: p. 1347.
7. Lennox (1943) Bull. New York. Acad. Med. 19: p. 47.

Toxic symptoms like dizziness, muscular inco-ordination, gastric disturbances, swelling of the gums, loss of weight during treatment indicate lessening of dosage first, if not successful the drug may have to be stopped altogether atleast for the time being. But a regular life, with good diet coupled with physical exercise appear to lessen the incidence of toxicity.

Tridione in control of psychomotor attacks has proved quite effective[8] when psychic disturbances accompany epilepsy tridione in 0.32g or 5 gr doses thrice daily coupled with phenobarbitone, bromides and when required with hydantoin have been remarkably useful, in some the results have been dramatic.[9]

Though in some sensitive patients tridione has produced some visual disturbances and light headedness to pass off in due course. The above dosage is usually safe. These cases were diagnosed clinically as well as by electro-encephalogram.

Glutamic acid in[10] 4 gram doses thrice daily, i.e. a total of 12 g (though twice this amount may be tolerated) has been found effective in the treatment of minor epilepsy, psychic equivalents and personality disorders in epilepsy.[11] By itself it is not so effective, but when a patient is completely under the influence of hydantoin, already detailed, and to the limit of his tolerance, yet manifests symptoms of irritability etc. should get glutamic acid in the above dosage. It is not bad to taste.

Bromides and other sedatives in the treatment of epilepsy, given in gradually increasing doses to the limit of patient's tolerance appear to be not half so effective as the above remedies like hydantoin with sedatives etc.

LUMINAL, PROMINAL GROUP.

These barbiturate groups of drugs have though more or less the same action as bromides, yet they have the advantage

8. Lennox (1945 Dec. 15) Jour. Amer. Med. Assoc. 129 : p. 1089.
9. Dejong (1946 March 2). Ibid. 130 : p. 565.
10. Price, Waelsch, and Putman (1943 Aug. 21) Jour. A.M.A. p. 1153.
11. Queries and minor notes (1945 May 26) J.A.M.A. p. 318.

that even after prolongd use, the mental depression and slowing of physical functions, so characteristic of bromide therapy for prolonged period, are not met with. *Combined with bromides, prominal,* the recently introduced useful drug, is of of considerable help.

Belladonna and other drugs. Sodium biborate in five to ten grains, alone or with bromides and luminal, twice daily, may be useful for both the types of the disease. *Tincture Belladonna* in five to ten drops, twice daily with the sedatives, like luminal and bromides, deserve the same consideration as sodium biborate.

Liquor trinitrini, is useful in one minim, twice daily for minor epilepsy and visceral attacks. But all these drugs should be given proper trial and the suitable ones should be stuck to.

ANY FEBRILE REACTION MAY BE USEFUL.

Peculiarly enough any marked febrile illness, not uncommonly, has led to the cessation of fits. This fact is known from the time of Hippocrates, about two thousand years back. There are possibilities in further research in this line.

Treatment during the fit. During the fit the clothes should be made loose, specially near about the neck, to ease the respiratory difficulty. The tongue should be prevented from being bitten, by some suitable device etc. During an aura, *smelling salt, or amyl nitrite* inhalation, or when there is a regular march of the sensation from periphery towards the trunk, a tape or a rubber tubing or a strong chord may be *tied round the limb to prevent the approach of* it, and may be with good results. The patient should be left as much undisturbed as possible, after a fit, and whenever possible may better be allowed to pass the period of exhaustion at rest in the same spot.

Status epilepticus. The treatment of this may be a very trying matter, and may tax the doctor's resources to the utmost.

When it is threatening, a prescription like the following for an adult may help in preventing it.

Tincture opii	m. 5
Potassium bromide	gr. 20
Chloral hydrate	gr. 15
Liquor morphine hydrochlor	m. 20
Simple syrup	m. 60
Chloroform water upto	fl. oz. one

one dose every three to four hourly, or as required in urgent cases one dose of the above mixture may be given rectally also every two hourly.

In bad cases, resisting average line of treatment, one may have to push *sodium amytal or luminal, injections in three grains or more.* One dram of potassium bromide with half a dram of chloral hydrate given in four ounces of saline, high up rectally as retention enema, repeated every three to six hours may be of some help. Paraldehyde in four to eight drams with two ounces of olive oil or four ounces saline as retention enema may be useful. Intramuscular injection of 10 c.c. of paraldehyde for an adult may prove useful.

Injections 1/100 to 1/50 gr. of hyoscine hydrobomide subcutaneously, every few hours, in resistant cases, may prove effective. Glucose, digitalin, strophanthin, veritol etc. may have to be given by injection according to indications of cardiac or systemic weakness, notably in continued fits over prolonged periods.

Nourishment, glucose and fluids, may only possibly be given, through the nasal catheter, or Ryles tube.

Mental and Psychotherapeutic aspects. As the mental condition of the patient, generally deteriorates, care may be taken to prevent this. But unfortunately this is not practicable. The psychic aspect, whenever, found to have any bearing on the particular case, should properly be dealt, Post epileptic automatism may involve medicolegal questions of great complexity[12] through some criminal action of the patient.[13] The education of young patients may have to be given in separate schools.

Surgical treatment, like trephining or removal of the cervical sympathetic ganglia, etc. are being tried, with variable success, but their discussion is beyond the scope of the pre-

12. Oates, (1930), Med. Annual. p. 309.
13. Underwood, (1936), Ibid. p. 406.

sent work, and the knowledge has not crystallised yet. Recently denervation of the adrenals[14] is done with some success.

Questions of marriage. Cases of epilepsy with a known aetiological factor, unrelated to heredity, may be permitted to marry. If there is any suspicion that the disease is cryptogenic and inspite of careful and painstaking prolonged search no cause could be determined, notably if there is the least touch of any probable hereditary factor, it is safe not to marry, as there is definite possibility for the children of suffering from this disease. This should not and naturally cannot, for obvious reasons, be taken, as a law, as there are variations to the above usual findings.

COMMON DISEASE OF THE LOCOMOTOR SYSTEM

CHAPTER LXXXV

COMMON FORMS OF ARTHRITIS AND FIBROSITIS ETC.

DIAGNOSIS ETC.

The rough and ready reckoning of the type of arthritis as determined from age incidence alone though may prove very easy, and helpful, cannot, for obvious reasons, be exact. Based on age, disease appearing primarily from two to five years, Still's disease, five to twenty rheumatic fever, twenty to fifty infective arthritis of various types, when acute such as gonococcal, streptococcal, tuberculous etc. when sub-acute or chronic, rheumatoid or nonspecific infective or atrophic type of arthritis. From forty-five to seventy years hypertrophic or osteo-arthritis, due to same cause and so on.

Most of the workers in this line have, more or less, accepted the classification of arthritis by Cecil.[1]

Non Specific Infective Arthritis (Rheumatoid Arthritis)

Almost certainly this condition is due to absorption[2] of materials and sensitization from septic foci[3] either in the

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14. Crile, (1934), Ann. of Surg. 100: p. 667.
1. Cecil, (1933), Jour. Amer. Med. Assoc. April, 22: p. 1220.
2. Goldie and Griffiths, (1936), Brit. Med. Jour. ii. p. 755.
3. Short, Dienes and Bauer, (1937), Jour. Amer. Med. Assoc. June, 19: p. 2087.

teeth, tonsils, gall-bladder, appendix or in the respiratory, gastro-intestinal, genito-urinary tracts. Though more common in females from the twentieth year onwards, no age or sex is exempt. It may have various modes of onset. In the acute form, there is usually multiple, symmetrical arthritis, affecting first mainly the smaller joints of the extremeties with peri-articular inflammation, associated with slight pyrexia, sweating, enlargement of the spleen, leukocytosis and quick rate of sedimentation of the erythrocytes.[4] In the untreated, gradually deformity appears, from contractures, ankylosis, sub-luxation, and small osteophytic masses appear in the joints in some cases. The patient gradually loses the power of his limbs which may all be contracted in various ways. Certain degree of anaemia is almost invariable. Skiagram shows it to be atrophic form of arthritis, because there is some rarefaction of the bones around the involved joint. Women at climacteric are also commonly affected. An exact diagnosis depends, besides the above clinical manifestations on.—

(1) Examination of the material excised from joints. (2) Sedimentation rate of erythrocytes and haemogram. (3) Culture of blood and joint fluid. (4) Agglutination reaction with strepto-haemolyticus. (5) Determination of uric acid content of blood. (6) Roentgenological examination of the joint etc. There may be acute, sub-acute and chronic types.

TREATMENT

Early treatment is very useful. As rheumatoid arthritis is an intractably progressive disease, so it should be attacked from all aspects, as early as possible. When streptococci get a strong foothold, it is difficult to eradicate them, hence before they get a firm footing one should try to remove them, wherever possible, permanently and radically. They may be encountered in the areas already named. Where the source is not obvious, careful investigation of the digestive tract, the prostate, gall-bladder, caecum, appendix, to find out the causative organisms, should be made. A doudenal tube may help considerably, by showing streptococci in the bile got through it. Associated coli[5] infection of the pelvis of the kidney may be present and the urine should be cultured.

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4. Hartung and Davis, (193[6]), Ibid. April, 25. p. 1449.
5. Slot and Deville, (1936), Brit. Med. Jour. i, p. 1155.

Acute and Subacute stages. During this stage all the fighting forces of the system should be stimulated to greater activity to combat the diseased process. For this purpose fresh air, sun-shine, good food, with all the proximate and vitaminous elements, cheerful surroundings are of value. Rest of the body as well as of the joint may be useful. It may be a question of months if not of years.

Local. The joints should be immobilised notably during the painful acute stages. The acuteness may be too much for any local treatment. But as soon as posible the parts should be gently rubbed or touched with some counter-irritant, liniment, etc. *Contrast bath,* meaning immersion alternately in hot and cold water, after counter-irritant rub, may do much good. The muscles around the swollen joint gradually atrophy down hence the importance of fitting them in position of optimum rest, and usefulness, so that if contractures follow some use is possible and the patient may not be a burden.

Gold Therapy etc.

Myocrisin and Solganol B oleosum and others. Hartfall and Garland[6] (1936) reporting on the result of 374 cases, 77 males and 297 females, in not more than 0.1 g. better 0.05 or 0.01 g. of gold salt, per intramuscular injection, once a week or according to reaction etc., toxic reactions[7] like, headache, malaise, increased pain in the joints, rise in temperature, abdominal pain, vomits, transient albuminuria, itching of the skin etc. may manifest themselves in about 37 per cent of of cases, as opposed to 45 per cent formerly, when bigger dosage were given. According to the above workers, about 78 per cent were either much improved or got cured. But equally competent workers, doubt its efficacy.[8] Myocrisin is one of the most extensively used gold salts for this purpose. A total dose of one gm in ten weeks is adequate.

Sulphur Injections and Malaria therapy.[9] These are yet in the experimental stage and nothing can be said definitely about them. So far their results appear promising.

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6. Lancet, (1936), i, p. 1459.
7. Crosby, (1936), Ibid. p. 1463. Jour. Amer. Med. Assoc. (1947, March 15) 133 : p. 749, 752, 754.
8. Phillips, (1936), New Eng. Jour. Med. i, p. 114.
9. Sastin and Spanbock, (1935), Med. Record. Oct. 2. p. 332.

Lumber Granglionectomy,[10] in the treatment of chronic arthritis is not always justified by the result and notably from the nature of the grave risks of the operation and subsequent result.

Vaccines etc. Stock vaccines or even autogenous vaccines in usual doses given sub-cutaneously are not of much use. If autogenous vaccines are given in very big doses to evoke a moderate reaction some good, though often temporary, may follow. Streptococci isolated from the septic foci hidden or apparent, given in very gradually increasing doses, per vein,[11] starting from one fourth of a million according to the reaction, stage of disease, subsequent effect etc. may be of some definite good. Milk protein or T.A.B. vaccine in 100 to 500 millions, former intramuscularly, the latter sub-cutaneously may be of some effect.

DIET, MEDICINES ETC.

Diet. Contrary to the popular idea, the diet should consist of good portions of animal protein and less of carbohydrates. It should contain all the vitamins in adequate amounts. Codliver oil, fruit juice, other vitamin concentrates, plenty of C in fruit juice, and B vitamin in the form of eggs etc. are useful.

Anaemia and achlorhydria. These are quite common[12] and for this purpose a prescription like the following one may prove useful.

Liq. Ferri Perchloride	m.	15
Acid Hydrochloric dilute	m.	20
Peppermint water	upto fl. oz	1

One dose after food twice daily to be sipped through a tube with double the amount of water. Tonics consisting of iron, arsenic, strychnine, malt extract are of use.

Chronic intestinal intoxication. Toxic absorption from the intestinal tract may be beneficially affected by some of the intestinal antiseptics. Some of the best are, bacillus acidophilus, or lactic acid bacilli. Iron and hydrochloric acid after food are of use too. Salol, thiocol etc. are of doubtful efficacy. Bowel wash daily for one week, ensuring

10. Young, (1936), Brit. Med. Jour. ii, p. 375.
11. Cecil and others, (1935), Jour. Amer. Med. Assoc. p. 1161.
12. Moltke and Ohlsen, (1936), Lancet, ii, p. 1034.

Some facts. At present the disease is prevalent in many parts of India. Though it was suggested that the rice eaters are mainly affected, there is very little to substantiate this, as numerous cases are occuring amongst persons who are not rice eaters, and also many rice eaters donot get it. There appears also a seasonal prevalence and recrudescence of this disease.

Clinically. The person affected usually shows gastro-intestinal symptoms mainly in the form of diarrhoea and fever of a mild or moderate degree. There appears *pinkish* oedema of the feet and the legs to extend to the thighs and all over the body in bad cases, which feel warm to the touch. This is due to the dilatation of capillary blood vessels in those affected areas. Dilated capillaries in the form of angiomata often protrude out from the surfaces of the skin. They bleed freely when the surface epithelium is eroded out, unless checked either by cauterisation or by sutures. Vomiting up of profuse quantities of blood may terminate the picture in rare cases. These sarcoids, or verruca indiana infectiva a name suggested by De for these angiomatous out growths are not uncommon in the gum margins, thighs, trunk and other fleshy parts of the body. Glaucoma is a very frequent complication, in the untreated, leading ultimately to blindness. Congestive type of cardiac failure is common in the neglected advanced cases. The oedema is often progressive, starting from the periphery of the extremeties creeps up the trunk. Cyanosis, dyspnoea, prominent veins in the neck are common with other signs and symptoms of congestive cardiac failure. Blood pressure and electro-cardiogram should be taken in bad cases, even at regular intervals when indicated.

TREATMENT

General. The patient should be confined to bed and kept reasonably warm. In serious cases with cardiac embarrassment he should be propped up and other measures suitable for the condition as laid down in the chapter on right sided cardiac failure are to be adopted.

Diet. Though most of the workers are in favour of cutting off rice from the list of dietary, actually in practice we do not find appreciable change for the worse even if the patient is allowed to take some good quality of *rice, specially* the sun-dried variety (Atop rice) and not the parboiled variety. But rice is insipid to taste without salt, the sodium

ion of which tends to increase the oedema, hence the advisability of substituting bread or chattu (powdered lentils) for rice. *But mustard oil should totally be with-held, and the cooking done by butter or ghee etc. Pure milk, just once boiled, with bananas, and molasses or milk, and egg, fresh fruits, raw vegetable in the form of salad* etc., *wholemeal bread, pea, beans, and other nourishing articles of diet* should be given as far as practicable. For those who cannot afford the expensive articles of diet, one may give, powdered and germinating grams, *raw onions, radishes, tomatoes etc., sour milk* (*Dahi*) *butter milk, fried paddy* (Khoi) or rice (Muri) with *milk, banana* and *molasses*, are good diet for these patients. *Meat, milk, casein,* (*channa*) and preparations from the latter such as *sondesh*, etc., are of use. *Fruits and all the vitamins* should form a good part of the dietary of the individual. *Salt and water should be restricted* in the average case and totally with-held from the graver ones, specially, in congestive cardiac failure.

Proper rest, good protein rich diet specially abundance of *animal protein*, massage from below upwards of the lower limbs with some bland oil, such as olive oil, may be of use. Whole-meal bread may be substituted for rice.

Vitamins. Though deficiency of B vitamin is suggested to be a predisposing factor in the production of this condition yet there appears very little proof in favour of this contention. Marmite soup is a good diuretic. It is better prepared by dissolving one to two teaspoonfuls of marmite in a cup of hot water, the juice of a lemon and a little salt when added to it makes a good hot drink. It should be taken twice or thrice a day. *Bemax*, and *yeast* tablets are easy to take. Yolk of eggs, liver are rich in this vitamin.

Drugs. Ephedrine hydrochloride in quarter to one grain, repeated every six to eight hours, or *tincture ephedra vulgaris* twenty to thirty or more drops, twice or thrice daily is advocated on account of its action on the peripheral capillary blood vessels, the affection of the latter being a major pathological process of the disease, as emphasised before. The investigators of the School of Tropical Medicine, Calcutta, suggest the use of this drug in congestive cardiac failure, as, digitalis is not of any use. We have also found it useful.

Though the above workers advocate *calcium* therapy, the few cases in which serum calcium is determined by us,

show no lowering of blood calcium content from normal. D vitamin, which tends to raise and stabilise the blood calcium, may also be given.

In many cases a prescription like the following has done much good, even cases with bad type of cardiac failure responded well to this mixture.

Ephedrine hydrochlor	gr.	1/4 to 1/2
Extract Punarnava Liquid	m.	60 to 90
Calcium gluconate or lactate	gr.	10
Ferrous sulphate	gr.	2
Diuretin	gr.	5
Glucose	gr.	60
Chloroform water	upto fl. oz.	1

one dose thrice or four times a day.

The iron in big doses combats anaemia and is of use. But it appears useful for its diuretic action too. As the patient improves, the frequency of this medication may be reduced to twice daily instead of four times a day. *Diuretics* are of value.

Sometimes due to the anaemia and the gastro-intestinal upset, there is some hypo-chlorhydria or achlorhydria, and the high protein diet, rich in many other constituents, is not properly digested by the patient specially at the commencement of the treatment hence a prescription like the following in a cup of water, sipped after the two principal meals, may be of benefit.

Acid hydrochloric dilute	m.	15
Glycerine acid pepsin	upto m.	60

one tea-spoonful as directed after the principal meals. This acid mixture is best taken through a glass tube, or by suction, as coming in contact with acid the teeth may be unpleasantly affected. In carbohydrate indigestion, ten grains each of pancreatin, takadiastase, lactopeptin, in a powder, twice daily after meals may be of use. But it is rather expensive.

Change. A change to a bracing and dry climate may be of service.

Oedema of the lung may be the cause of death in a few cases. Here atropine in 1/100 to 1/64 gr. doses subcutaneously, and in bad cases blood letting may do good.

Heart failure etc.

For the details of this, the chapter on right sided cardiac failure should be consulted.

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